The Healthy Newborn

A Reference Manual for Program Managers









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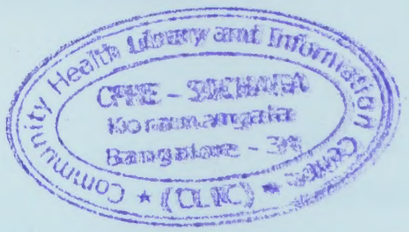
The Healthy Newborn

A Reference Manual for Program Managers



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The WHO Collaborating Center in Reproductive Health

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About This Manual

Why was the manual written?

Of the estimated 8 million babies who die just before birth or in the first 28 days of life, 98 percent die in developing countries. Yet almost all the books about newborn health are aimed at the two percent of deaths in high-technology care in industrialized countries. There is a dearth of information to enable program managers to design, implement and evaluate effective interventions to address the important problem of improving newborn health. This manual has grown out of a partnership between the WHO Collaborating Center in Perinatal Care at the Centers for Disease Control and CARE. While implementing programs to address fetal and neonatal mortality, we realized the need for such a reference manual and CD-ROM resource.

Who is the manual for?

We hope the information will be useful for a variety of people who are committed to improving maternal and newborn outcomes. However, the primary audience is program managers, including regional or district level health professionals, non-governmental organization (NGO) project managers, and other programmers in developing countries. This information may be useful for Ministry of Health (MOH) officials, NGO headquarters staff, and technical staff of international donor agencies. It may also serve as a supplemental training guide for medical, nursing, and public health professionals.

What is the focus of the manual?

There is rapidly growing international recognition of the importance of fetal and neonatal mortality. Although this manual recognizes the importance of both the mother and the baby, the primary focus is on the relatively neglected fetus and newborn.

What does the manual offer?

For global standards of health care for mothers and newborns to have an impact, program managers must apply them at the local level. This manual aims to serve as a user-friendly reference assisting program managers to systematically implement evidence-based standards that will have the greatest effect on newborn health in their setting. The manual offers an overview of global newborn health issues and a systematic approach to analyzing data, identifying problems, selecting interventions, and evaluating their progress. Evidence-based interventions are summarized and are illustrated with lessons learned from the field.

How to use the manual?

This manual can be used in many ways. Some readers may want to read it straight through. Others may prefer to read only specific parts and then refer to other parts as needed. While this is not a training manual, a number of useful supplementary materials are provided on the attached CD-ROM.

OVERVIEW

Introduction – Many program managers face multiple problems and have limited resources. The introduction discusses the program managers and stakeholders for newborn health and outlines some principles for newborn health programming. An example is given of how the manual can be applied in the field.

INTRODUCTION

Part One – Part One covers the reasons to focus on mothers and newborns as well as discusses why the newborn has been neglected. The lack of reliable information on newborn health is highlighted. There is also a dicussion on how, where, and why fetal and neonatal deaths occur. We also stress the importance of underlying issues inhibiting access to quality services, including the "four delays" and low social status of mothers and newborns.

PART ONE
An Unheard Cry for Newborn Health

Part Two – This section describes the need for information to assess and manage newborn health. Epidemiological tools and a discussion on how to design and use an adaptable health management information system are included in this Part. This part introduces an information tool for newborn health, the BABIES matrix (based on birth-weight groups and age-at-death), that allows simple categorization of fetal and neonatal deaths. Quality management principles and tools are outlined and many quality management resources are included on the CD-ROM.

PART TWO
A Newborn Health Management Information System

Part Three – Systematic program management using information and involving the community is essential for sustainable success. The four steps of the program management cycle are:

1. define the fetal-neonatal problem;
2. assess performance of the health care delivery system;
3a. prioritize interventions;
3b. implement interventions; and
4. monitor progress and evaluate outcomes.

PART THREE
A Step-by-Step Approach: The Program Management Cycle

Part Four – Key principles for effectively implementing interventions are outlined in this section. There are five Intervention Packages: 1) pre-pregnancy care, 2) care during pregnancy, 3) care during delivery, 4) postpartum care of the mother and 5)newborn care (discussed further in terms of essential newborn care, extra newborn care, and emergency care).

PART FOUR
Interventions for Newborn Health and Lessons Learned

Last Word – This section concludes with a brief appeal for more global attention to be focused on the newborn and for partnership at all levels to work together on improving newborn health. Finally, some practical advice on getting started.

LAST WORD
Into Action for Newborn Health

The CD-ROM Resource – The attached CD-ROM contains an electronic version of this manual that is hyperlinked to selected references and many additional useful documents, including clinical guidelines, quality management tools, and epidemiology texts. The CD-ROM contents are described on the last page of the appendix.



TABLE OF CONTENTS

TABLE OF CONTENTS iii

LIST OF TABLES viii

LIST OF FIGURES xii

LIST OF LESSONS LEARNED (PANELS) xiv

ACKNOWLEDGEMENTS xvi

REVIEWERS xvii

MESSAGES TO THE PROGRAM MANAGER

Dr. Tomris Turmen	Newborn Health: The Global Perspective	xviii
Anne Tinker	Healthy Mothers, Healthy Newborns	xix
Prof. William Foege	Healthy Newborns, Healthy Children, Healthy World	xx
Dr. Hu Ching-Li	The Healthy Newborn: A Systems Approach That Works	xxi

INTRODUCTION xxii

THE AUTHORS xxxi

ACRONYMS xxxii

LIST OF ICONS xxxiii

PART ONE - THE UNHEARD CRY FOR NEWBORN HEALTH

I. Why Focus on Mothers and Babies? 1.4

A. Maternal and Newborn Outcomes 1.4
B. Focus on the Newborn 1.5
C. Focus on the Mother 1.6
D. Focus on the Mother *and* Baby 1.7

II. Why Have Pregnancy, Childbirth, and the Newborn Been Neglected? 1.9

A. Low Status of Women and Newborns 1.9
B. Invisibility 1.10
C. Inadequate Quality of Available Data 1.14
D. Institutional and Programmatic Gaps 1.16
E. Perceived Impossibility 1.17

III. The Magnitude of Fetal-Neonatal Mortality 1.18

A. How Many Fetal-Neonatal Deaths Occur? 1.18
B. When Do Infants Die? 1.20
C. Where in the World Do Newborns Die? 1.21
D. Where in the Health Care System Do Newborns Die? 1.24

TABLE OF CONTENTS

Step 3b. Implement Interventions **3.49**
A. Summary of Steps 1, 2, and 3a 3.51
B. What is an Implementation Strategy? 3.51
C. How Can Data/Information be used to Implement Interventions? 3.52
D. What are the Key Strategies for Implementing Interventions? 3.55
Summary of Step 3b 3.68

Step 4. Monitor Progress and Evaluate Outcomes **3.69**
A. Summary of Steps 1, 2, 3a, and 3b 3.71
B. What are Monitoring and Evaluation? 3.72
C. From Global to Local Indicators 3.73
D. How to Select Indicators in the Local HMIS 3.75
E. How Can Information be Used to Monitor and Evaluate Newborn Programming? 3.79

Summary of Step 4 ..... 3.83

III. Summary: Step-by-Step **3.84**

"Bring It All Together" Summary of Tools Used in Step-by-Step Approach 3.88

A. Using BABIES Matrix to Identify Problems and Focus on the Interventions 3.88
B. Using the Health Fishbone and Countermeasure Matrix to Develop an Action Plan 3.90
C. Using the Management Fishbone and Countermeasur Matrix for Monitoring and Evaluating the Interventions 3.91

PART FOUR - INTERVENTIONS FOR NEWBORN HEALTH AND LESSONS LEARNED

Messages for Part Four 4.2

Terminology for Part Four 4.3

I. Principles of Newborn Health Interventions **4.4**

A. Interventions for the Mother *and* the Baby 4.4
B. Systems Approach 4.4
C. Acceptable Intervention Packages 4.6
D. Prioritization in the Local Setting 4.6

II. Addressing the Delays in Receiving Quality Maternal and Newborn Care **4.8**

A. Delay One: Problem Recognition Within the Home 4.11
B. Delay Two: Deciding to Seek Care 4.13
C. Delay Three: Reaching the Health Facility 4.14
D. Delay Four: Receiving Appropriate Quality Care at the Facility 4.17

III. Description of Intervention Packages and Package Components **4.18**

A. What is an Intervention Package? 4.18
B. Using the Spider Web Framework to Design an Integrated System 4.19

TABLE OF CONTENTS

IV. Intervention Packages by Time Period 4.21

A. Pre-Pregnancy Health Intervention Package 4.21
B. Care During Pregnancy Intervention Package 4.28
C. Care During Delivery Intervention Package 4.47
D. Postpartum Care of the Mother Intervention Package 4.56
E. Newborn Care Intervention Package 4.57
E.1. Essential Newborn Care Intervention Sub-Package 4.58
E.2. Extra Newborn Care for the LBW Baby Intervention Sub-Package 4.80
E.3. Emergency Care for the Sick Newborn Intervention Sub-Package 4.92

Best Reading for Part Four 4.112

References 4.114

LAST WORD - INTO ACTION FOR NEWBORN HEALTH

I. Into Action Globally: A New Cry for Global Newborn Health LW.1

II. Into Actional Locally: Practical Suggestions for Getting Started LW.3

APPENDIX

Glossary A.1

Summary Tables of Interventions by Strategy for each Section A.8

TABLE 1: Basic and Additional Equipment, Supplies and Drugs for Care of the Newborn A.8
TABLE 2: Best Practices for Pre-pregnancy Health by Intervention Strategy A.9
TABLE 3: Best Practices for Care During Pregnancy by Intervention Strategy A.10
TABLE 4: Best Practices for Care During Delivery by Intervention Strategy A.11
TABLE 5: Best Practices for Essential Newborn Care by Intervention Strategy A.12
TABLE 6: Best Practices for Extra Care for LBW Babies by Intervention Strategy A.13
TABLE 7: Best Practices for Emergency Newborn Care by Intervention Strategy A.14

Guide to Using the CD-ROM A.15

Pages for Photocopying A.16

Figure 1.3 Intervention Package for Time Periods of Pregnancy, Neonatal, and Infant Life A.17
Figure 1.8 Conceptual Framework for Causation of Fetal-Neonatal Deaths A.18
Table 2.11 BABIES: An Example Using Raw Numbers A.19
Figure 3.2 The Fishbone Diagram Used to Understand the Root Cause of Neonatal Tetanus A.20
Figure 3.10 Health Countermeasure Matrix A.21
Figure 4.3 Spider Web of Intervention Packages by Time Period (Blank) A.22
Figure 4.3 Spider Web of Intervention Packages by Time Period (Filled-In) A.23
Figure 4.2 Danger Signs for the Mother and the Newborn Throughout Pregnancy, Childbirth, Postpartum, and the Newborn Periods. A.24

LIST OF TABLES

	TITLE	PAGE NO.
PART ONE		
Table 1.1	Associated Adverse Maternal and Newborn Outcomes	1.8
Table 1.2	Perinatal and Neonatal Mortality Rate by Region	1.23
Table 1.3	Major Causes of Fetal-Neonatal Death	1.30
Table 1.4	Estimates of Neonatal Mortality by Major Causes	1.32
Table 1.5	Countries with the Highest Estimated Number of Neonatal Tetanus Cases	1.33
Table 1.6	Estimated LBW Prevalence and Numbers by Region (1995-1999)	1.37
Table 1.7	Infections in Pregnancy Related to Maternal and Fetal-Neonatal Outcomes	1.45
Table 1.8	Breastfeeding Advantages	1.47
Table 1.9	Increasing Relative Risk of Neonatal Mortality without Breastfeeding	1.48
Table 1.10	Understanding Reasons for Delays in Access Around the World	1.52
PART TWO		
Table 2.1	Summary of Epidemiological Definitions from 2x2 table	2.15
Table 2.2	Variation in Attributable Risk by Change in Risk Ratio and Frequency of Determinant	2.19
Table 2.3	Summary of Basic 2x2 Table and Selected Definitions for the Example in Figure 2.2	2.21
Table 2.4	Examples of Profile Groupings	2.24
Table 2.5	Surveillance Roles of Each Component in the HCDS	2.27
Table 2.6	Example of Essential Data to Collect for a Minimum Data Set for Newborn Health in a General HMIS	2.32
Table 2.7	BABIES Concepts	2.40
Table 2.8	Reading the BABIES Matrix	2.43
Table 2.9	Interpreting the BABIES Tool	2.46
Table 2.10a	The "Opportunity Gap" Step-by-Step using BABIES in Cali, Columbia	2.50
Table 2.10b	Birth Weight Proportionate Mortality Rates (Excluding Standard Population) Age at Death and Birth Weight Group	2.50
Table 2.10c	Birth Weight Proportionate Mortality Rates (Local Standard) by Age at Death and Birth Weight Group	2.51
Table 2.10d	Birth Weight Proportionate Mortality Rates by Intervention Package	2.51
Table 2.11	Actions for Implementing the BABIES Matrix	2.52
Table 2.12	BABIES: An Example Using Raw Numbers	2.53
Table 2.13	Selected Mortality Rates Derived from BABIES that are Useful for Program	2.56
Table 2.14	Choices of a Standard Population by Which to Define the "Opportunity Gap"	2.58
Table 2.15	Birth Weight Proportionate Fetal-Infant Mortality Rates that can be Used for Standard Comparisons when Calculating the "Opportunity Gap"	2.58
Table 2.16	Birth Weight Proportionate Mortality Rates for Grouped Intervention Packages in Six Selected Geographic Regions and Sub-Populations	2.59
Table 2.17	Dimensions of Quality	2.69
Table 2.18	Steps in the Quality Improvement Story	2.72
Table 2.19	Problem Statement Example	2.73
Table 2.20	The QI Story Review	2.79

LIST OF TABLES

	TITLE	PAGE NO.
Table 2.21	Selected Quality Management Tool Description	2.80
Table 2.22	Quality Tools Used in the QI Steps and Their Relationship to the PDCA Cycle	2.82
Table 2.23	Requirements of Effective Training	2.84
PART THREE		
Table 3.1	Examples of Stakeholders by Sector	3.9
Table 3.2	Actions for Identifying the Problem for Newborn Health	3.15
Table 3.3	Sources of Existing Data on Fetal-Neonatal Health Problems	3.16
Table 3.4	Methods for Collecting Additional Targeted Data to Define the Problem	3.17
Table 3.5	Reasons for Using Rates	3.18
Table 3.6	Using a Standard Population to Determine Whether There is a Problem	3.19
Table 3.7	Choices of a Standard Population to Define the "Opportunity Gap"	3.20
Table 3.8	Questions to Further Understand the "Opportunity Gap"	3.22
Table 3.9	Performance Assessment: Care During Pregnancy Example	3.36
Table 3.10	Assessing Performance of the HCDS Sectors: Example of Care During Delivery	3.37
Table 3.11	Tools to Assess Performance in HCDS	3.38
Table 3.12	Examples of Results from Steps 1 and 2	3.44
Table 3.13	Examples of Goals and Objectives	3.53
Table 3.14	Timeline for Neonatal Resuscitation Training	3.55
Table 3.15	Factors to Consider When Working with Communities	3.58
Table 3.16	Successful and Unseccessful Approaches for Addressing the Community Reality	3.59
Table 3.17	The Four Stages of Behavioral Change	3.61
Table 3.18	Assessing Audiences' Knowledge and Behaviors: Example Early Breastfeeding	3.62
Table 3.19	Behavioral Goals for Maternal and Fetal-Neonatal Health	3.64
Table 3.20	Characteristics of Capable Institutions	3.66
Table 3.21	Differences Between Monitoring and Evaluation	3.72
Table 3.22	Types of Indicators	3.74
Table 3.23	Summary of the Four-Step Program Management Cycle with Useful Tools for Each Step	3.86
PART FOUR		
Table 4.1	Interventions that Benefit Both Mother and Newborn	4.5
Tables 4A.1	Pre-Pregnancy Health Invervention Package - Package Component - Family Planning	4.22
Tables 4A.2	Pre-Pregnancy Health Invervention Package - Package Component - Preconception Nutrition	4.24
Tables 4A.3	Pre-Pregnancy Health Invervention Package - Package Component - Infections	4.26
Tables 4A.4	Pre-Pregnancy Health Invervention Package - Package Component - Status and Education	4.22
Tables 4B.1	Care During Pregnancy Invervention Package - Package Component - Provide Client-Centered ANC Services	4.32

LIST OF TABLES

	TITLE	PAGE NO.
Tables 4b.2	Care During Pregnancy Invervention Package - Package Component - Nutrition in Pregnancy	4.37
Tables 4B.3	Care During Pregnancy Invervention Package - Package Component - Anemia in Pregnancy	4.40
Table 4.2	Investigation and Treatment of Infections in Pregnancy	4.44
Table 4B.5	Care During Pregnancy Invervention Package - Package Component - Birth Planning	4.45
Table 4C.1	Care During Delivery Intervention Package - Package Component - Skilled Attendant	4.51
Table 4.3	Danger Signs in Pregnancy	4.52
Table 4.4	Emergency Obstetric Care Standards	4.53
Table 4C.2	Care During Delivery Intervention Package - Package Component - Emergency Obstetric Care	4.54
Table 4.5	Management of Preterm Labor	4.55
Table 4E1.1	Essential Newborn Care Intervention Sub-Package - Sub-Package Component - Neonatal Resuscitation	4.63
Table 4E1.2	Essential Newborn Care Intervention Sub-Package - Sub-Package Component - Clean Chain	4.66
Table 4E1.3	Essential Newborn Care Intervention Sub-Package - Sub-Package Component - Warm Chain	4.68
Table 4E1.4	Essential Newborn Care Intervention Sub-Package - Sub-Package Component - Breastfeeding	4.70
Table 4E1.5a	Essential Newborn Care Intervention Sub-Package - Sub-Package Component - Cord Care	4.72
Table 4E1.5b	Essential Newborn Care Intervention Sub-Package - Sub-Package Component - Eye Care	4.74
Table 4.6	Benefits of and Barriers to HIV Testing of Pregnant Women	4.76
Table 4E2.2a	Extra Newborn Care Intervention Sub Package - Sub Package Component - Care for the Well LBW Baby (1.5 to 2.5 kg)	4.84
Table 4E2.2b	Extra Newborn Care Intervention Sub Package - Sub Package Component - Care for a LBW Baby Who is Ill and All Very LBW Babies (Less Than 1.499 kg)	4.85
Table 4E2.3	Extra Newborn Care Intervention Sub Package - Sub Package Component - Extra Support for Feeding	4.88
Table 4E2.4	Extra Newborn Care Intervention Sub Package - Sub Package Component - Extra Warmth	4.90
Table 4E3.1	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Neonatal Danger Signs	4.94
Table 4E3.2	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Quality Care of the Sick Baby	4.96
Table 4E3.3	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Severe Infection	4.98

List of Tables

	TITLE	PAGE NO.
Table 4.7	Presentations, Possible Organisms, and Treatment for Severe Neonatal Infection	4.99
Table 4E3.4	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Neonatal Tetanus	4.102
Table 4E3.5	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Neonatal Asphyxia	4.105
Table 4E3.6	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Neonatal Jaundice	4.107
Table 4E3.7	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Birth Defects	4.109
Table 4E3.8	Emergency Newborn Care Intervention Sub-Package - Sub-Package Component - Severe Bleeding	4.111

LIST OF FIGURES

	TITLE	PAGE NO.
PART ONE		
Figure 1.1	Reproductive Health of the Mother and Outcomes for the Baby	1.4
Figure 1.2	Barriers to Obtaining Information on Pregnancy and Birth Outcomes	1.12
Figure 1.3	Intervention Package for Time Periods of Pregnancy, Neonatal and Infant Life	1.15
Figure 1.4	Changes in Late Fetal, Nenonatal and Post-Neonatal Mortality Rates - 1983 to 1999	1.19
Figure 1.5	When do Infants Die?	1.20
Figure 1.6	Global Distribution of Perinatal Mortality	1.22
Figure 1.7	Proportion of Deliveries with a Skilled Attendant, Related to Maternal, Perinatal, and Neonatal Mortality	1.25
Figure 1.8	Conceptual Framework for Causation of Fetal-Neonatal Deaths	1.29
Figure 1.9	Nutrition and LBW Through the Life Cycle	1.38
Figure 1.10	Outcomes for Babies of HIV-Positive Mothers	1.42
Figure 1.11	Fetal-Neonatal Outcomes of Maternal Syphilis	1.44
Figure 1.12	Moving Towards a New Paradigm for Maternal and Child Health Programming	1.57
PART TWO		
Figure 2.1	The Count-Divide-Compare (C-D-C) Cycle	2.7
Figure 2.2	Epidemiological Example	2.8
Figure 2.3	Epidemiological Definition: Counts	2.9
Figure 2.4	Epidemiological Definition: Numerator	2.9
Figure 2.5	Epidemiological Definition: Denominator	2.10
Figure 2.6	Epidemiological Definition: Ratio	2.10
Figure 2.7	Epidemiological Definition: Proportion	2.11
Figure 2.8	Epidemiological Definition: Rate	2.11
Figure 2.9	Technical Tip: Estimating the Number of Live Births	2.12
Figure 2.10	Epidemiological Definition: Incidence and Prevalence	2.13
Figure 2.11	Epidemiological Definition: Indicator	2.13
Figure 2.12	Basic 2X2 Table	2.14
Figure 2.13	Why Use Rates?	2.16
Figure 2.14	Epidemiological Definition: Risk Ratio	2.17
Figure 2.15	Epidemiological Definition: Attributable Risk Percent	2.18
Figure 2.16	Epidemiological Definition: "Opportunity Gap"	2.22
Figure 2.17	Actions and Attributes of an HMIS	2.25
Figure 2.18	Using and Designing an HMIS	2.28
Figure 2.19	The Maternal Record	2.33
Figure 2.20	The Community Monitoring Board Used in Rural Tanzania	2.34
Figure 2.21	Picture of a Delivery Room Log Book	2.35
Figure 2.22	Abbreviated Line Listing of Delivery Room Log Book	2.35
Figure 2.23	Delivery Room Log Tick Table	2.36
Figure 2.24	BABIES Matrix	2.39
Figure 2.25	Intervention Package for Time Periods of Pregnancy, Neonatal and Infant Life	2.41

LIST OF FIGURES

	TITLE	PAGE NO.
Figure 2.26	The 12-Cell BABIES Matrix	2.43
Figure 2.27	BABIES Matrix Count-Divide-Compare	2.44
Figure 2.28	Grouping the Cells in BABIES by Intervention Package	2.45
Figure 2.29	Calculating Rates for BABIES – Example: Rate of Deaths During Delivery (Cells 6 and 10)	2.54
Figure 2.30	Using BABIES To Identify Priority Intervention Package	2.62
Figure 2.31	Using BABIES to Identify Indicators Associated with Intervention Packages	2.63
Figure 2.32	Plan-Do-Check-Act Cycle	2.71
Figure 2.33	Quality Improvement Story	2.72
Figure 2.34	The Fishbone Diagram	2.74
Figure 2.35	The Countermeasure Matrix	2.75
PART THREE		
Figure 3.1	The Program Management Cycle	3.10
Figure 3.2	The Fishbone Diagram used to Understand the Root Cause of Neonatal Tetanus	3.24
Figure 3.3	Summary for Step 1, Defining the Fetal-Neonatal Health Problem	3.27
Figure 3.4	A Web of Integrated Intervention Packages by Time Period	3.35
Figure 3.5	Assessing Traditional Practices	3.39
Figure 3.6	The Countermeasure Matrix used to Identify Interventions and Strategies to Address Short Stays in a Health Center After Delivery	3.47
Figure 3.7	Principles of a Local Indicator Matrix	3.77
Figure 3.8	Example of Local Indicator Matrix for Mortality During Delivery to BABIES ≥2500 G	3.78
Figure 3.9	Using the BABIES and the Health Fishbone as Tools to Identify a Problem and Its Root Causes	3.89
Figure 3.10	Health Countemeasure Matrix	3.90
Figure 3.11	Management Fishbone	3.91
Figure 3.12	Management Countermeasure	3.92
Figure 3.13	BABIES and a Complete Local HMIS Indicator Matrix	3.93
PART FOUR		
Figure 4.1	Pathway Healthy Maternal and Newborn Care	4.9
Figure 4.2	Danger Signs for the Mother and the Newborn Throughout Pregnancy, Childbirth, Postpartum, and the Newborn Periods	4.11
Figure 4.3	Spider Web of Intervention Packages by Time Period	4.20
Figure 4.4	The WHO Partograph for Monitoring Progress in Labor	4.49
Figure 4.5	Alternative Methods for Identifying LBW Babies	4.83

LIST OF LESSONS LEARNED

	TITLE	PAGE NO.
PART ONE		
Panel 1.1	Uncounted Fetal and Neonatal Deaths in Thailand	1.11
Panel 1.2	Delay in Decision-Making	1.50
Panel 1.3	A Beautiful Daughter	1.51
PART TWO		
Panel 2.1	Community Monitoring Board as a Tool to Prioritize Interventions	2.40
Panel 2.2	The "Opportunity Gap" Step-by-Step Using BABIES in Cali, Colombia	2.50
Panel 2.3	The Community Revises its Monitoring Board	2.64
Panel 2.4	Using Fishbone	2.77
Panel 2.5	Improving the Quality of Obstetric Services in Guatemala	2.83
PART THREE		
Panel 3.1	Reducing Perinatal Mortality in Rural Bolivia	3.60
Panel 3.2	The Green Pendelu in Mali: Altering Community Attitudes to Pregnancy	3.65
PART FOUR		
Panel 4.1	Using One Death to Prevent Others in a Community in Malawi	4.10
Panel 4.2	A Handful of Newborn Danger Signs in Guatemala	4.12
Panel 4.3	Pedaling for Obstetric Emergencies in Tanzania	4.15
Panel 4.4	Community Saving Funds for Medical Emergencies in Nigeria	4.16
Panel 4.5	Effect of Increased Pregnancy-Spacing on Neonatal and Infant Mortality	4.23
Panel 4.6	Preventing Neural Tube Defects with Floic Acid in China	4.25
Panel 4.7	Peanut Cookies, Pregnancy, and Reduced Perinatal Mortality	4.34
Panel 4.8	Mosquitoes, Malaria, and Mother-Baby Outcomes	4.41
Panel 4.9	Prenatal Syphilis Screening Policy and Practice in Mozambique	4.43
Panel 4.10	Improving Maternal Survival in Bangladesh	4.46
Panel 4.11	Resuscitation Protocol Reduces Neonatal Mortality by Two-Thirds in a Chinese Province	4.62
Panel 4.12	Community-Based Neonatal Resuscitation in India	4.64
Panel 4.13	Social Marketing of Clean Delivery Kits in Rural Nepal	4.67
Panel 4.14	Keeping Newborns Warm in Nepal	4.69
Panel 4.15	Being Friendly to Babies	4.71
Panel 4.16	Preventing Mother-to-Child Transmission of HIV in Sub-Saharan Africa	4.78
Panel 4.17	Breastfeeding and HIV in Ndola, Zambia	4.79
Panel 4.18	Simple Care Saves Small Babies in a Ghanaian Hospital	4.86
Panel 4.19	Kangaroo Care	4.91
Panel 4.20	Home-Based Newborn Care Package Reduces Neonatal Mortality by Over 60 Percent in Rural India	4.100
Panel 4.21	Cord Care, Cow Dung, and Neonatal Tetanus	4.103

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MESSAGES

TO THE PROGRAM MANAGER

NEWBORN HEALTH: THE GLOBAL PERSPECTIVE

Message from DR. TOMRIS TURMEN
Executive Director, Family and Community Health WHO, Geneva

In modern times, improvements in knowledge and technological advances have greatly improved the health of mothers and children. Targeted, selective interventions, such as immunization and oral rehydration therapy, have resulted in substantial reductions in infant mortality. However, we are increasingly aware that improvements in the health and survival of the youngest infants, those aged less than one month, have not kept pace. Every year, over four million babies less than one month of age die, most of them during the critical first week of life; and for every newborn who dies, another is stillborn. Most of these deaths are a consequence of the poor health and nutritional status of the mother coupled with inadequate care before, during, and after delivery. Over 98 percent of these perinatal deaths occur in developing countries and among the poorest groups. Unfortunately, the problem remains unrecognized or – worse – accepted as inevitable in many societies, in large part because it is so common.

There is a widely shared but mistaken idea that improvements in newborn health require sophisticated and expensive technologies and highly specialized staff. The reality is that many conditions that result in perinatal death can be prevented or treated without sophisticated and expensive technology. What is required is essential care during pregnancy, the assistance of a person with midwifery skills during childbirth and the immediate postpartum period, and a few critical interventions for the newborn during the first days of life. Ensuring that all babies are born into a clean and warm environment, that those who need help in breathing get it, and that mothers and babies are supported in breastfeeding are not complex and difficult tasks. The establishment and maintenance of systems to provide such support to a mother and her baby is among the key responsibilities of the programme manager.

This manual provides a much needed resource for program managers to draw upon, combining epidemiology, evidence-based interventions, and a guide to step-by-step programming. The manual outlines how to generate and use information to identify the problem and to select approaches that are feasible in low-resource settings. Although the problems are global in scope, the solutions must be local. Informed decision-making and leadership by the program manager are essential.

MESSAGES

TO THE PROGRAM MANAGER
HEALTHY MOTHERS, HEALTHY NEWBORNS

Message from ANNE TINKER
Director of Saving Newborn Lives, A Gates Foundation-funded Initiative of Save the Children U.S.
Formerly Lead Health Specialist at The World Bank

Every minute, somewhere in the world...
...8 babies die in the first month of life
...6 babies die in the first week
...8 babies are stillborn.

Maternal and newborn deaths could be prevented by available, cost-effective interventions. Newborn health has been particularly neglected and requires focused attention. Newborn outcomes are closely linked with the mother's health. Up to 70 percent of fetal and newborn deaths could be prevented by interventions targeting the mother. Both mother and baby will benefit from appropriate antenatal care, such as infection prevention and treatment, nutritional supplementation, and tetanus toxoid immunization, as well as skilled attendance during delivery and referral care for complications.

The majority of maternal and newborn deaths occur during the first days after delivery, yet this is a time that has been grossly ignored in health strategies and programs. An early postpartum contact with a health professional is important to identify any problems facing mother or baby. Promoting appropriate newborn care, such as immediate and exclusive breastfeeding, thermal control, and clean cord care, can also further prevent newborn deaths.

This manual emphasizes the links between the mother's and the baby's health. It provides an overview of interventions through the lifecycle of the mother to benefit newborn and mother. In addition, there are many useful documents contained on the CD-ROM, including important global standards in care during pregnancy and childbirth.

Application of these approaches and interventions will save the lives of mothers and newborns, but requires new emphasis on newborn health by individual program managers for their local areas. Major reductions in mortality rates for neonatal and fetal mortality are possible, even in a relatively short time if program managers work with their partners to prioritize local problems and address these. The local NGO, SEARCH, in Maharashtra, India, was able to reduce neonatal mortality by two thirds in a two-year period through home-based interventions.

MESSAGES

TO THE PROGRAM MANAGER

HEALTHY NEWBORNS, HEALTHY CHILDREN, HEALTHY WORLD

Message from PROFESSOR BILL FOEGE
The Director of Task Force for Child Survival, and Senior Health Advisor to the Gates Foundation, Distinguished Professor of International Health, Emory University School of Public Health, Atlanta

Many of our experiences are too unique to be shared, while others are so universal as to bind us to all people in the world and to all people who have ever lived. An example of the latter is the mixture of happiness and anxiety as we wait for the reassurance that our newborn is healthy. And then the absolute undiluted joy when we learn that it is true. For some the outcome is different and what should have been one of the happiest moments of life turns to loss or disability. This manual seeks to make undiluted joy more frequent, to share what has been learned with everyone, and to encourage strategies to give every child a head start regardless of where they are born.

The facts are clear and stark. The world has made tremendous progress in some health areas. Smallpox is gone, polio and guinea worm will soon be a thing of the past, and measles rates have declined. In other areas, the gap between what is possible and what actually exists is unconscionably large. Infant mortality rates may differ by 20-fold or even 30-fold. Most progress has been in postneonatal deaths, while rates of neonatal and fetal deaths have changed little. Neonatal mortality now accounts for about 66 percent of all infant deaths. If this were a totally logical world, we would put absolute priority on those first hours and days. Either they provide for a lifetime or they become the lifetime. Few disparities are as great in health as are the risks to both mothers and newborns in the best versus the worst areas of the world.

This manual is striking in the breadth and depth of the review. It is reminiscent of a statistical account of Scotland that George Washington was asked to review. His comments on March 15, 1793, included this statement: "I am fully persuaded, that when enlightened people, will take the trouble to examine so minutely into the state of society, as your inquiries seem to go, it must result in greatly ameliorating the condition of the people, promoting the interests of civil society, and the happiness of mankind at large." In like manner, I am fully persuaded that this manual will improve the state of newborns around the world, and the happiness of their parents.

The manual is more than detailed. It is also program manager "user friendly." It shows managers what has worked in other areas, lets then decide which interventions they should use, and encourages evaluation to document improvements. Of great importance is the opportunity it provides to see rapid results. As with so many things in global health, the science accumulated and the experience of others is of no use if not applied. Science problems still exist, but the real problems are management problems. This manual provides explicit guidance in management — defining the problem, assessing performance, securing the assistance of other groups, prioritizing actions, monitoring progress, and providing transparency to the evaluation of what is working and what needs to be changed.

Finally, this publication is a rebirth of interest in the birthing process. It is a single-volume equivalent of a post graduate course for the program managers faced daily with the quandary of improving health with scarce resources. Application of these techniques will lead to children's lives being saved, parents who watch their children grow up, and a world that benefits from the contributions of those lives. The ripples that will result from the application of this manual will be felt for all time.

MESSAGES

TO THE PROGRAM MANAGER

THE HEALTHY NEWBORN: A SYSTEMS APPROACH THAT WORKS

Message from DR. HU CHING-LI
Professor of Pediatrics and Senior Advisor, Shanghai No.2 Medical University,
Previously Assistant Director General of WHO

Despite improvement in childhood and infant mortality rates in the last two decades, the perinatal and neonatal mortality rates, particularly in some developing countries, remain unchanged. In 1995, the neonatal mortality rate was 39 per 1,000 live births in developing countries. In Africa, this rate was 75 per 1,000 live births. The rate was 53 per 1,000 in Asia (as a whole), which is ten times higher than in North America.

The problem is larger than previously acknowledged, and there is no single intervention that will provide a universal solution. Although the solution requires consensus at the global level, adapted national policy and strategy will only be effective if the community is actively involved. The program manager currently lacks materials to guide them in decision-making for local newborn health programs. Attempts to solve the problem will be unsuccessful if the local program manager does not provide quality services. Providing quality services requires a systems response, involving the health system, the community, and the intersectoral system (transport, education, etc.). This system can reduce the perinatal and neonatal death rates by implementing the "packages" of interventions described in WHO's "Mother and Baby Package" and most recently in "Making Pregnancy Safer."

This manual strongly emphasizes the need for a system, including practical guidance on assessing the system, strengthening its capacity, and improving the quality of its services. The manual also provides many inspiring examples from low-resource settings. It helps the program manager prioritize which evidence-based interventions will be most effective and feasible in their setting and to evaluate whether the intervention improved newborn health outcomes.

The approach described in this manual is not new, but it does require perseverance. WHO successfully used it in Shunyi County, Beijing, China in the 1980s. This systematic approach, using epidemiology, clinical practice guidelines, and public health management principles, identified asphyxia and neural tube defects as major problems in Shunyi County. Implementing changes in clinical practice reduced the perinatal mortality from 27 to 17 per 1,000 total births (34%) in two years. Subsequently, a large community-based intervention program was successful in reducing neural tube defects through periconceptual folic acid supplementation. This program will have a lasting effect at the national level.

The lessons learned in Shunyi are adaptable today. You, as a program manager, can adapt and apply the step-by-step approach and reduce fetal and neonatal deaths in your area, thereby significantly improving the life of your community.

INTRODUCTION

TARGET AUDIENCE

Who Is the Program Manager?

Several types of people can be considered program managers. In this manual when we refer to the program manager, we include all individuals whose task it is to make decisions about programs for maternal and newborn health. This may include:

- district/Regional Medical Officers;
- managers of NGO programs; and
- regional or national managers of safe motherhood/reproductive health/child survival programs.

While this is not an exhaustive list, we hope it is clear that we are targeting those who make decisions about and implement programs. In many settings there may be several program managers with slightly different roles, but they all make programmatic decisions. Therefore, from this point forward, when the term **program manager** is used, it may refer to one or several of these people.

The overall role of the program manager is to facilitate the provision of quality information and services to the population, with an overall aim to achieve the highest level of health possible. No one organization can do this alone, and partnership is key.

Who Are the Stakeholders for Newborn Health?

There are many definitions of stakeholders. In simple terms, they are the key ***people that either make or influence decisions in the community, formal health care system, or the intersectoral sector.*** The stakeholders in one community will be very different from those in another community, and local knowledge is required to identify the important stakeholders for a given program.

In this manual when we refer to the stakeholders for newborn health, we include all individuals who make or influence maternal and newborn health decision-making. This may include:

- women leaders;
- community and religious leaders;
- providers of clinical services;
- public health policy makers; and
- local representatives of the inter-sectoral sector, (such as education/transport or rural development).

There are many reasons, presented below, for involving each stakeholder group in every step of programming.

- Develop broad ownership of the problem.
- Identify all the existing resources available to address the problem.
- Motivate collective action, according to the strengths of the various partners.
- Design interventions and strategies that reflect the local needs (i.e., be respectful of local culture) and that promote sustainability.

INTRODUCTION

PRINCIPLES

Principles for Maternal and Newborn Health Programming

There are four main principles that will be discussed throughout this manual. These principles are the keys to effective newborn health programming.

1. **Rights** – The right of the mother and baby to access needed services.
2. **Systems approach** – The importance of a systems approach to address the complex problems of maternal and fetal-neonatal deaths. This requires a comprehensive view of the health care delivery system (HCDS), including the community. Each sector has an important role to play in addressing fetal and neonatal mortality.
3. **Health management information system (HMIS)** – The need for information for decision-making.
4. **Management process** – The effectiveness of a management process to organize and synthesize information and to mobilize key stakeholders to react to the problems identified in the local setting related to fetal-neonatal mortality.

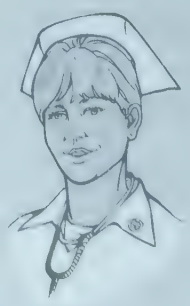
Principle 1: Rights of the Mother and Baby

The most basic human right is the right to life. Yet every year an estimated 585,000 women die from pregnancy-related causes, and approximately 8 million babies die in late pregnancy or during the first 28 days of life. Almost all of these deaths occur in the developing world. The problem is not a lack of interventions but a lack of equity in implementing interventions known to work.

Maternal and fetal-neonatal survival depends on a continuum of basic services throughout pregnancy, delivery, and the postpartum/newborn period. The aim is to match the needs of the mother–baby dyad with the appropriate level of care within the HCDS. The purpose of this approach is **not** to have all women delivering in institutions. We advocate that a skilled provider is present at each delivery, but in many settings, delivery may occur at peripheral health institutions or at home. In order for women and newborns to access the "right care at the right time," families and communities must be empowered and educated. Women and their families need to have information about danger signs for themselves (during pregnancy, childbirth, and the postpartum period) and for their newborns, as well as a plan for reacting to an emergency. Key stakeholders (i.e., providers, policy-makers, men) also need to be actively involved in the development and application of protocols that make the best use of limited resources.

The health of the MOTHER and the BABY will be improved by a system that ensures...
...the Right Person
...in the Right Place
...at the Right Time
...doing the Right Thing
...in the Right Way





This is the RIGHT of the mother and the baby.

INTRODUCTION

PRINCIPLES

Principle 2: A Systems Approach

Fetal-neonatal deaths result from a complex combination of interrelated social and medical causes. No single intervention can address this problem. Therefore a *systems approach* is required, the core principles of which are:

S	**situation**-sensitive approach, using local data to define the problem;
Y	**you,** the program manager, matter in making a difference;
S	**systematic** decision-making to prioritize and implement evidence-based interventions;
T	**teamwork** involving all stakeholders;
E	**empowerment** of women, their families, communities, and health institutions;
M	**management** information system to monitor and evaluate progress and impact; and
S	**sustainable** results.

Throughout this document the term *systems* will refer to interrelated components, operating as a whole, to efficiently achieve a specific goal. In this manual, the goal is the reduction of fetal-neonatal deaths. The most important parts of the system are a comprehensive HCDS and an adaptable HMIS.

Comprehensive HCDS – The World Health Report 2000 defines health systems as "all of the organizations, institutions, communities, and resources that are devoted to producing health actions." This includes three levels that affect health decision-making:

1. The **community/informal sector,** consisting of individuals, households, and communities (i.e., families and community health providers, such as traditional birth attendants, village doctors, herbalists).
2. The **formal health care system,** composed of the people and institutions that provide health services including preventive and curative interventions. They include government, private providers, and institutions.
3. The **intersectoral system,** composed of the sectors of society, such as education and transportation, which indirectly affect health.

Throughout the document, when the HCDS is discussed, it will refer to all three of the sectors. The role of each sector varies in different settings, but involvement of all sectors in every step of decision-making is vital. Involving stakeholders and taking time to listen makes for a slower process but one that is more likely to succeed and be sustainable.

More in PART Four

As well as involving the three levels of the HCDS, a systems approach for newborn programming addresses the relevant time periods for intervention, which include:

- pre-pregnancy health;
- care during pregnancy;
- care during delivery;
- postpartum care of the mother; and
- newborn care (essential, extra and emergency).

INTRODUCTION

PRINCIPLES

Principle 3: Adaptable HMIS

An HMIS is a basic system for collecting and analyzing key pieces of data. It allows the program manager and key stakeholders to organize their data and transform the raw data into useful information for decision-making. An information system provides the means to manage by fact. In many settings, program managers have data (they are data-rich), but they either lack the data they need to answer key questions or they lack the means to analyze the data at a level that would be the most useful. An HMIS does not have to be cumbersome or expensive. However, it must be carefully designed and analyzed to answer the key questions at the most appropriate level. An HMIS can provide data to answer two key questions:

More in PART Two

- **Am I doing the right things?**
  Do the interventions selected address the problem that was identified?

- **Am I doing things right?**
  Are the interventions that were selected being done in the right way (i.e., are they available, accessible, acceptable, affordable, appropriate)?

BABIES

This tool allows program managers to locate the main neonatal and infant mortality problems based on two pieces of data: age at death and birth weight. BABIES is an acronym for:

More in PART Two

B	birth weight and
A	age at death
B	boxes for
I	intervention and
E	evaluation
S	system

BABIES allows the program managers to plot whatever data they have in terms of age at death and birth weight, assess where problems exist, prioritize what further information to collect, select interventions to address the problem, and choose indicators to monitor the progress of those interventions. This tool will be explained further in Part Two.

INTRODUCTION

PRINCIPLES

Principle 4: Program Management Cycle: A Step-by-Step Approach

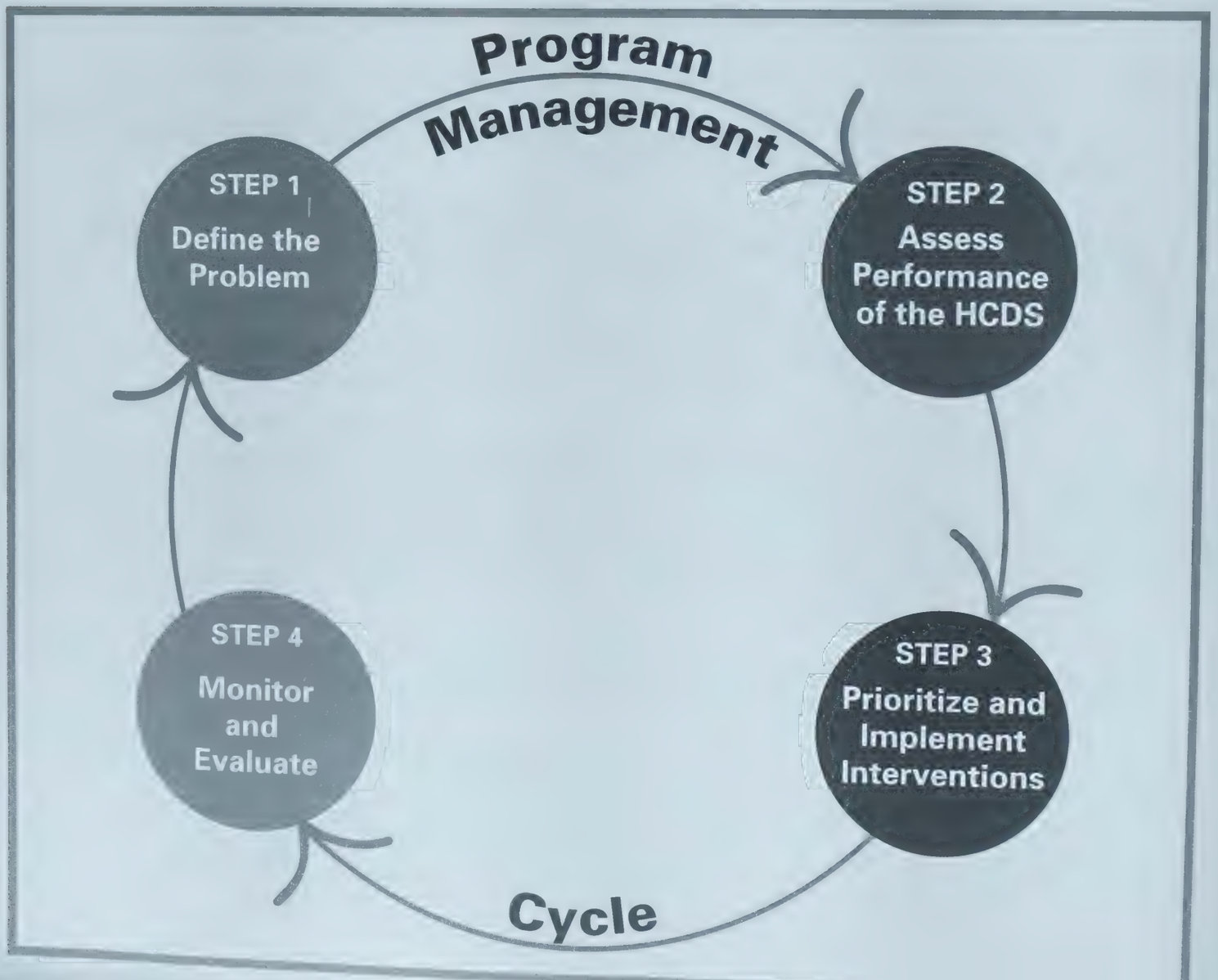
More in PART Three

The ***program management cycle*** is a four-step cycle to assist program managers in identifying the problem in their setting, assessing performance of the HCDS, prioritizing and implementing appropriate interventions, monitoring process, and evaluating the outcomes. The four steps are shown below and covered in detail in Part Three.

At every point in the program management cycle, program managers should:

- involve all of the HCDS (formal, informal, and intersectoral) to review the information to generate potential solutions; and
- review data, possibly using the assessment tool (BABIES) and link this with other relevant data.

FIGURE I.1
THE PROGRAM MANAGEMENT CYCLE



INTRODUCTION

USING THE HEALTHY NEWBORN MANUAL

LIFE AS A PROGRAM MANAGER

The new District Medical Officer (DMO) sat at his desk, closed his eyes, and put his head in his hands. As soon as he arrived, he found a long list of needs in the district, including:

- deaths and much suffering due to HIV/AIDS and other STIs;
- mothers with long-term complication after pregnancy;
- many child deaths, especially among newborns and from infectious diseases in infancy; and
- adults missing work because of recurrent malaria.

The district hospital and the eight health centers were short of staff and supplies. Despite his many years of training and experience, he felt unprepared to tackle all of these problems.

IDENTIFYING PARTNERSHIPS

He heard that there was a nongovernmental organization (NGO) actively involved in health programming in the district, and he decided to meet with them. About a week later, the NGO program manager met with the DMO and his staff. The manager provided a briefing on the main problems and how they had been working to solve them. One of their key concerns was the high number of neonatal deaths, although they did not have any data to document the situation. Many babies were believed to be dying, mainly at home, and the causes of death were uncertain. The DMO agreed that this was a problem, and there were some data at the hospital level. However, he had not looked at the data and was unsure of how to analyze the available data. The NGO program manager said that she had recently received a manual entitled The Healthy Newborn: A Reference Guide for Program Managers. Although the manual was large, perhaps they could work through it together. They agreed to meet with some of their staff and review the manual over the following weeks.

NEWBORN HEALTH AS A PRIORITY (PART ONE)

At their next meeting, they reviewed the first part of the manual together and were surprised to discover three facts:

- there are an estimated eight million fetal-neonatal deaths each year;
- newborn health has major long-term consequences for the individual and society; and,
- most fetal and neonatal deaths could be prevented or treated with simple, low-tech interventions.

During the meeting, staff learned the definitions of fetal, perinatal, and neonatal mortality, which they had previously found very confusing. They also had a new appreciation of the importance of low birth weight for neonatal survival. This stimulated their thinking about what the problems might be for newborn health in their district and possible interventions.

INTRODUCTION

USING THE HEALTHY NEWBORN MANUAL

USING INFORMATION FOR DECISION-MAKING FOR NEWBORN PROGRAMMING (PART TWO)

At their next meeting, another member of the group presented what he had learned from reading Part Two, "A Newborn Health Management Information System." He was especially impressed with the need to find simple ways to collect information locally to help make good decisions. The assessment tool, BABIES (Birth weight by Age at death Boxes for Intervention and Evaluation System), struck them as a simple way to focus attention on one problem to investigate further. The tools for quality improvement inspired them to think of small, feasible projects that could be addressed in the community or clinic, such as a curtain to increase privacy for postpartum women so they could stay in the clinic and still feel comfortable breastfeeding.

After discussion, the district health team and the NGO staff agreed to collect available information from the district hospital, health centers, and community and to use this information to define the key problems for newborn survival. The key stakeholders would be informed and involved in the process.

A STEP-BY-STEP APPROACH: THE PROGRAM MANAGEMENT CYCLE (PART THREE)

The group worked through Part Three of the manual about the program management cycle. After some debate, the group agreed with the four steps:

1. Define the fetal-neonatal problem.
2. Assess system performance for fetal and neonatal health.
3. Prioritize and implement interventions to improve fetal-neonatal outcomes.
4. Monitor process and evaluate outcomes.

They decided to have a meeting with key stakeholders to understand their perspectives.

STAKEHOLDERS' VIEWPOINTS

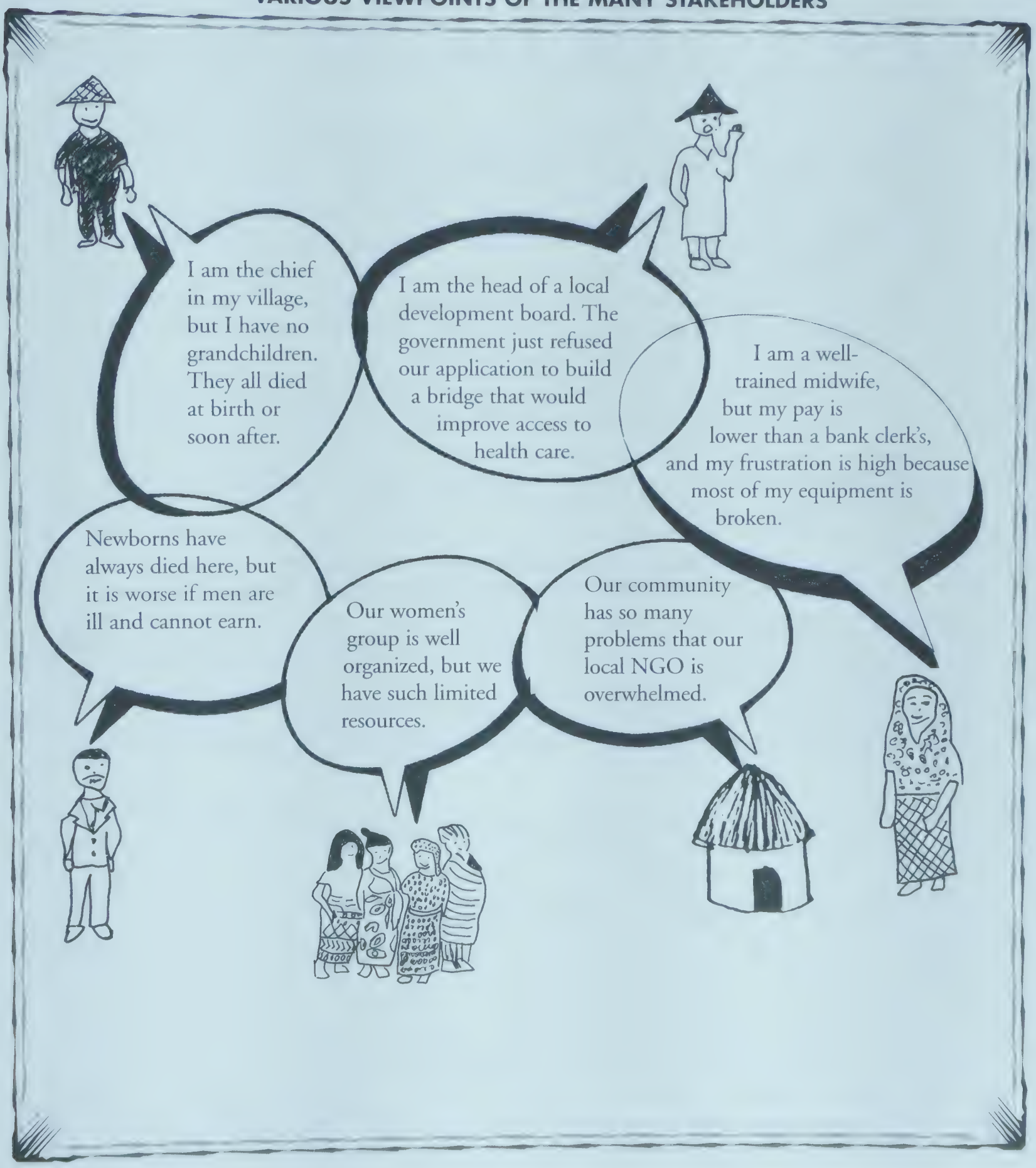
About 30 people crowded into a tiny, hot room. In addition to the district health team and the NGO team, there were:

- community leaders and individuals from the community;
- clinicians including a midwife and an obstetrician;
- the program manager of a local NGO;
- some Ministry of Health leaders, including the regional safe motherhood/reproductive health manager; and
- other local ministry members, including a representative from the ministry of rural development.

INTRODUCTION

USING THE HEALTHY NEWBORN MANUAL

FIGURE I.2
VARIOUS VIEWPOINTS OF THE MANY STAKEHOLDERS



INTRODUCTION

USING THE HEALTHY NEWBORN MANUAL

All of the individuals at the meeting had their own story of personal loss, problems in their own community, frustrations with their jobs in the clinic, difficulties with influencing policy or getting funds (Figure I.2). Newborn health was important to different groups for the reasons presented below.

- All of the stakeholders were concerned about the high number of newborn deaths, but were less aware of the importance of fetal deaths.
- There was concern about the effect that many newborn deaths had on increasing maternal deaths and worsening maternal health as women rushed into pregnancy after a fetal or newborn death.
- Since many newborn health problems had not been addressed and death rates were high, the group felt that this was an area in which, compared with other local problems, quick progress could be made and many lives saved.
- The program manager's NGO had recently made newborn health a priority area, and so there was a chance of getting some funds and technical input.

At this meeting, a short list of key stakeholders was identified to be actively involved in the decision-making process.

WHAT TO DO TO IMPROVE NEWBORN HEALTH: INTERVENTIONS AND LESSONS LEARNED (PART FOUR)

The DMO, the program manager, and their teams were keen to find out what interventions could have an impact on newborn survival locally. Studying the evidence-based Intervention Packages in Part Four gave them many new thoughts on what could be done, even with little additional resources. The group particularly wanted to increase emergency preparedness for mothers and newborns. The resources on the CD-ROM, especially the WHO guidelines, provided helpful additional details.

We hope you find this manual useful. For more copies, please contact us at www.cdc.gov/nccdphp/drh.

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Dr. Lawn completed her medical school and postgraduate training in England, gaining membership of the Royal College of Paediatricians. She has spent much of her life in Africa, being born in a rural hospital in northern Uganda by emergency cesarean-section. In addition to involvement in various maternal and child health projects in Kenya and Malawi, Joy spent four years as a Lecturer in Child Health in a teaching hospital in Ghana. During this time she oversaw busy nurseries for sick newborns, promoted newborn health including resuscitation training and exclusive breastfeeding, and was actively involved in training medical students and postgraduate doctors. She recently completed a Masters of Public Health at Emory University, Atlanta. Joy is an enthusiastic advocate for newborn health, stressing the need to combine epidemiology, clinical skills, public health management, community participation and policy change to improve newborn survival. She is currently working on a number of newborn care clinical manuals and the global statistics for "The State of the World's Newborns," a report by Saving Newborn Lives. Joy has served as a consultant or on advisory groups for WHO, The Institute of Medicine, and NGOs, such as CARE and Save the Children.

BRIAN J. MCCARTHY, MD, MSC
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Dr. McCarthy completed his training and board certification in pediatrics. He served as an Epidemic Intelligence Service (EIS) Officer at CDC and completed its Preventive Medicine Residency. His assignment to the MCH Division in the State of Georgia resulted in frequent contact with county level programs on projects that included studies on teenage pregnancy, child abuse, risk assessment in regional programs, and an extensive investigation of under-reporting of infant deaths. During a three-year secundment to WHO/Geneva, he was introduced to MCH issues in developing countries. Upon his return to CDC, he was assigned to the WHO/CC. Over the next 18 years he focused on developing methods to improve maternal and perinatal health information systems, performing in-country MCH needs assessments and program evaluations for UN agencies, carrying out health service research, and conducting MCH epidemiologic and management workshops to develop the local level capacity in these topics. Dr. McCarthy has visited more than 25 developing countries while serving as a consultant to WHO, UNRWA, UNICEF, UNDP, UNFPA, the World Bank, and USAID. He also coordinates the WHO/CC participation in the CARE/CDC Health Initiative (CCHI).

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Ms. Ross began her career in intensive care nursing and has expanded her formal education to include Masters level training in public health. She is currently completing a second Masters in international business. Susan has served as a Senior Health Advisor to USAID in Eritrea, Nigeria, and Washington. Susan was the Asian Regional Technical Advisor for CARE, based in the Philippines. This position focused on providing technical assistance for the reproductive health programs in the ten Asian countries in that region. During her last five years at CARE, she has spearheaded an effort to improve maternal and newborn programs within CARE and its partners. Now a network of CARE staff supports the advancement of the state-of-the-art interventions in maternal and newborn programming. Susan has participated on several advisory groups for USAID, WHO, UNICEF, NGOs, and PVOs. Susan authored CARE's manual entitled Promoting Quality Maternal and Newborn Care: A Reference Manual for Program Managers, published in 1999. The Healthy Newborn Manual is a natural addition to that publication.

ACRONYMS

5As	Availability, Accessibility, Acceptability, Affordability, and Appropriateness
AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
BABIES	Birth weight & Age-at-death Boxes for Intervention & Evaluation System
BP	Blood Pressure
CARE	Cooperative Assistance for Relief and Development Everywhere
CDC	Centers for Disease Control and Prevention
C-D-C	Count, Divide, Compare Cycle
CFR	Case Fatality Rate
COD	Cause of Death
CSF	Cerebral Spinal Fluid
DMO	District Medical Officer
EmOC	Emergency Obstetric Care
G6PD	Glucose 6 Phosphate Dehydrogeanse Deficiency
HCDS	Health Care Delivery System
HMIS	Health Management Information System
HIV	Human Immunodeficiency Virus
ICD	International Classification of Disease
IMCI	Integrated Management of Childhood Illnesses
IMR	Infant Mortality Rate
IUGR	Intra-Uterine Growth Restriction
LBW	Low Birth Weight (birth weight less than 2.5kg)
LBWR	Low Birth Weight Rate
MCH	Maternal and Child Health
MCPC	Managing Complications
MOH	Ministry of Health
MMR	Maternal Mortality Ratio
MTCT/HIV	Mother-To-Child Transmission of HIV
NGO	Non-Governmental Organization
NMR	Neonatal Mortality Rate
NTD	Neural Tube Defect
PATH	Program for Appropriate Technology for Health
PLA	Participatory Learning and Action
PMR	Perinatal Mortality Rate
PRA	Participatory Rapid Appraisal
RPR	Rapid Plasma Reagin
SGA	Small for Gestational Age
SP	Sulphadoxine-Pyrimethamine
STI	Sexually Transmitted Infections
TBA	Traditional Birth Attendant
TQM	Total Quality Management
TT	Tetanus Toxoid
UNICEF	United Nations International Children's Fund
USAID	United States of America International Development
WHO	World Health Organization
WRA	Women of Reproductive Age

There is a detailed alphabetical glossary and alphabetical index in the appendix. Each part of the manual begins with a list of the key terms used in that part.

List of Icons



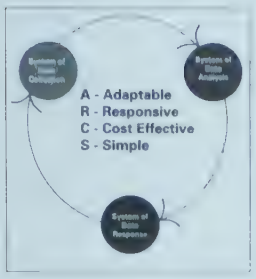
BABIES



CD-ROM



Health Care Delivery System



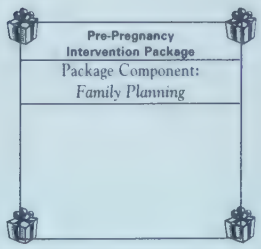
Health Management Information System



Program Management Cycle



Intervention Package



Intervention Package Component



Panel for Lessons Learned

Part

1

The Unheard Cry for Newborn Health

PART ONE

The Unheard Cry for Newborn Health

PAGE

Messages for Part One 1.2

Terminology for Part One 1.3

I. Why Focus on Mothers and Babies? 1.4

A. Maternal and Newborn Outcomes 1.4
B. Focus on the Newborn 1.5
C. Focus on the Mother 1.6
D. Focus on the Mother *and* Baby 1.7

II. Why Have Pregnancy, Childbirth, and the Newborn Been Neglected? 1.9

A. Low Status of Women and Newborns 1.9
B. Invisibility 1.10
C. Inadequate Quality of Available Data 1.14
D. Institutional and Programmatic Gaps 1.16
E. Perceived Impossibility 1.17

III. The Magnitude of Fetal-Neonatal Mortality 1.18

A. How Many Fetal-Neonatal Deaths Occur? 1.18
B. When Do Infants Die? 1.20
C. Where in the World Do Newborns Die? 1.21
D. Where in the Health Care System Do Newborns Die? 1.24

IV. Why Do Newborns Die? 1.26

A. Conceptual Framework 1.29
B. Direct Medical Causes of Fetal-Neonatal Deaths 1.30
C. Underlying Causes of Fetal-Neonatal Deaths 1.40
D. Delays in Access that Contribute to Fetal-Neonatal Deaths 1.49
E. Fundamental Causes of Fetal-Neonatal Deaths 1.53

V. What Can Be Done to Improve Newborn Health? 1.55

Best Reading for Part One 1.58

References 1.59



MESSAGES FOR PART ONE

1. Understand the importance of newborn health for child survival and the health of adults and the need for an integrated focus on the mother and the baby.

2. Learn some of the reasons why fetal-neonatal health has received little international attention.

3. Gain information about the magnitude of fetal-neonatal mortality and when and where those deaths occur.

4. Learn the major direct and indirect causes of fetal-neonatal deaths, including the importance of low birth weight, the effect of delays in access to quality maternal and newborn health care, and the impact of the low social status of women and newborn babies.

5. Grasp that the complexity of the problems of newborn health requires a shift in priorities for international health programs towards community-based, systematic approaches in the periods during which most maternal and infant deaths occur.

TERMINOLOGY FOR PART ONE

Fetal-infant mortality rate = $\frac{\text{Stillbirths + infant (first year) deaths}}{\text{total births}} \times 1{,}000$

Gestational age: Number of completed weeks since the last menstrual period of the mother. A term baby is a baby born between 37 and 42 completed weeks of gestation.

Infant mortality rate (IMR) = $\frac{\text{Deaths of infants under one year of age}}{\text{live births}} \times 1{,}000$

Late fetal death rate[1] = $\frac{\text{Babies born dead after 28 weeks of gestation (or birth weight over 1kg)}}{\text{total births}} \times 1{,}000$

Live birth: A baby born with any sign of life regardless of weight or gestation.

Low birth weight (LBW): Birth weight less than 2,500 grams

Neonatal mortality rate (NMR) = $\frac{\text{Number of babies born alive who die in the first 28 days of life}}{\text{live births}} \times 1{,}000$

Neonatal period: The first 28 days of life; divided into early neonatal period (first 7 days) and late neonatal period (days 8-28). In this manual neonatal and newborn will be considered equivalent.

Perinatal mortality rate (PMR) = $\frac{\text{fetal deaths (either from 22 or 28 weeks gestation)} + \text{early neonatal deaths (first 7 days of life)}}{\text{total births (live births + late fetal deaths}} \times 1{,}000$

Post-term birth: Live birth after 42 completed weeks of gestation.

Preterm birth: Live birth before 37 completed weeks of gestation.

Stillbirth: Baby born showing no sign of life who weights over 1 kg or is over 22 weeks of gestation.

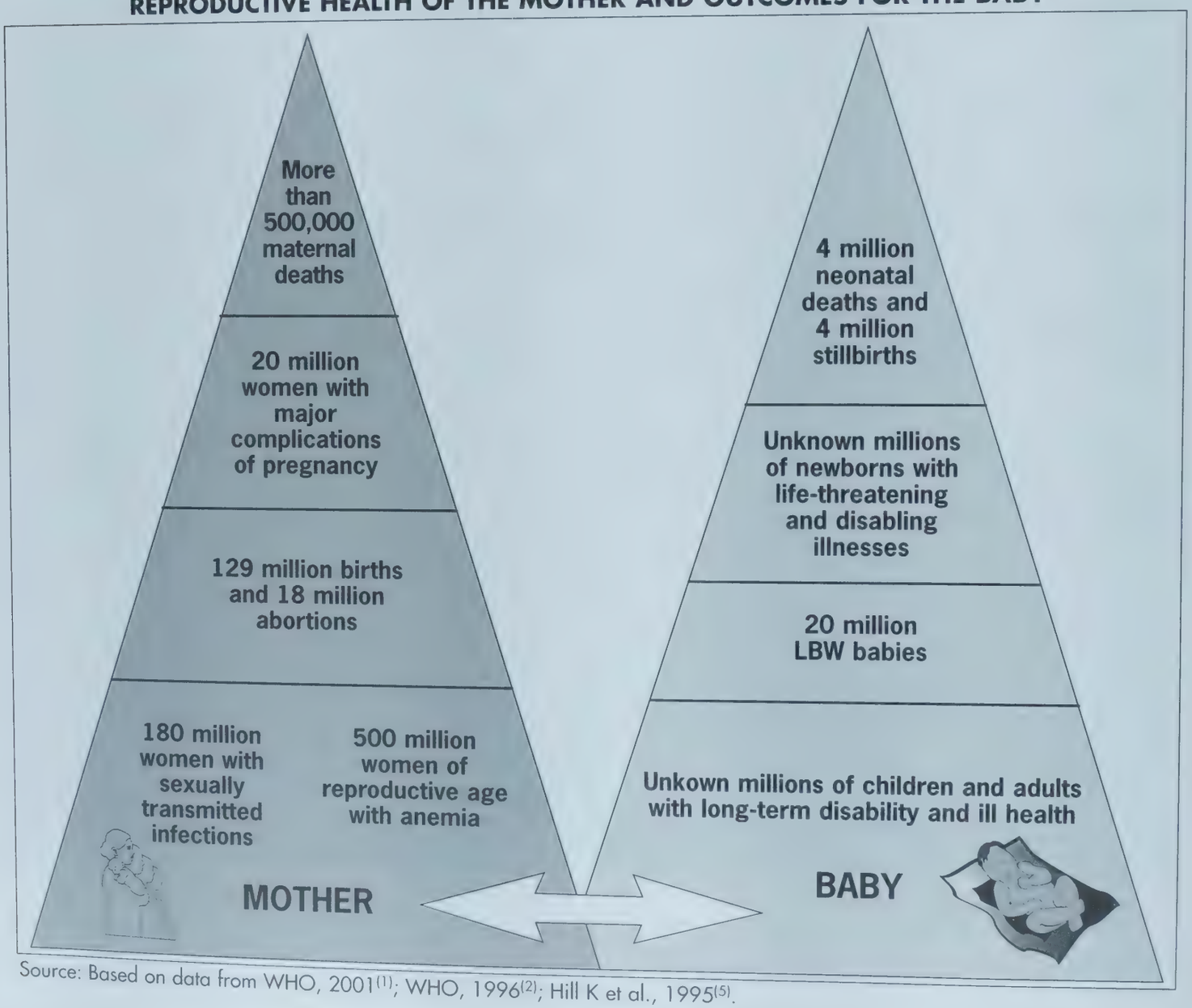
[1]WHO recommends that international comparison of fetal deaths or perinatal mortality be based on late fetal (after 28 weeks gestation of 1 kg birth weight). The International Classification of Disease definition of perinatal mortality includes fetal deaths from 22 weeks of gestation.

I. WHY FOCUS ON MOTHERS AND BABIES?

A. Maternal and Newborn Outcomes

Each year an estimated eight million babies are stillborn or die in the first month of life[1]. Almost all (98%) of these deaths occur in developing countries[2]. Of the seven million infants who die each year, approximately two-thirds die in the first month of life[3,4]. These shocking statistics should raise a loud cry for attention to newborn health in developing countries. Furthermore, despite over 10 years of safe motherhood programs, more than half a million women still die each year from pregnancy-related causes (Figure 1.1)[5-7].

FIGURE 1.1
REPRODUCTIVE HEALTH OF THE MOTHER AND OUTCOMES FOR THE BABY



Source: Based on data from WHO, 2001[1]; WHO, 1996[2]; Hill K et al., 1995[5].

Newborn deaths result from a combination of medical causes, social factors, and systems failures that vary by context and culture. In most settings, newborn health is closely associated with maternal health[8]. Maternal, fetal, and neonatal deaths have much in common:

- most occur in developing countries;
- many of the deaths occur at home;
- most of the deaths occur during delivery or in the early postpartum/neonatal period;
- many deaths occur without a skilled provider present;
- delay in access to quality care is critical for the survival of both mother and newborn;
- many families do not know the danger signs for the mother or the newborn;
- lack of transportation and resources are key issues related to delays in access to care;
- many of the pregnancy-related complications that negatively affect the mother also put the newborn at risk;
- the death of a mother may be directly linked to the death of her children;
- maternal, fetal, and neonatal outcomes are often unrecorded; and
- both women and newborns have low social status in many cultures with high maternal/newborn mortality[4,7,9-19].

B. Focus on the Newborn

The most obvious reason to focus attention and programs on newborns is the sheer number of fetal-neonatal deaths and the fact that neonatal mortality constitutes an increasing proportion of infant mortality. Neonatal deaths now account for about 66 percent of infant deaths globally because of falling postneonatal deaths over the last few decades[4]. However, there are many other compelling reasons, especially the importance of newborn health for health in later childhood and even adult life and the economic and social consequences of maternal and neonatal ill-health. The issue of healthy births has broader implications than simply reducing newborn deaths. In reality, it cuts across many priorities that are often considered separately.

Children's health: Approximately 66 percent of infant mortality occurs during the neonatal period[4]. Further progress in improving child survival requires more attention to newborn health. The benefits of a healthy newborn extend far beyond the neonatal period[8]. Babies with an unhealthy start, such as those with low birth weight, asphyxia, sepsis, or congenital abnormalities, may survive the neonatal period but are at greater risk of long-term disability and of dying later in childhood.

Women's health: Newborn health cannot be separated from the health and health care of women of reproductive age[8].

Chronic disease: Low birth weight babies may be more likely to develop diabetes and hypertension in later life[20-22]. A growing body of literature suggests that the health of the fetus may be a key determinant of chronic adult disease, such as hypertension, diabetes, and possibly chronic lung disease[20-22]. The "Barker hypothesis" suggests that the intrauterine environment "programs" aspects of chronic disease in adult life and that birth weight is a marker of this effect. There are many unanswered questions regarding this hypothesis[23]. If it is true, the implications would be enormous, especially for populations with high LBW rates, such as much of South Asia and sub-Saharan Africa[24]. Many developing countries are undergoing a demographic transition, resulting in rapid growth of the elderly population, along with an epidemiological transition, resulting in more chronic disease. Improving in utero health may be a highly cost-effective primary prevention intervention to reduce chronic disease, especially when compared with the cost of medical treatment of chronic diseases.

Individual and national economic prosperity: Low-birth-weight babies, preterm babies, and babies who were asphyxiated, severely jaundiced, or had a serious neonatal infection are much less likely to reach their educational or economic potential; they may also be more likely to require resources for care[25-27]. These children may have reduced intellectual development and chronic disability in adult life that limits their social and economic potential. Long-term follow-up of growth-restricted babies in Guatemala found that these babies grew up to be adults who weighed five kg less and were five cm shorter than their normal birth weight peers. Studies in several developed countries had similar findings[28]. Thus, LBW has implications for diminished physical strength and is especially important in communities where hard labor is common. Both school performance and cognitive abilities of LBW babies may be reduced, although study conclusions are complicated by difficulty in controlling for confounding environmental factors[25,26].

Ensuring that newborns are healthy is crucial to improving life expectancy and health for all persons.

C. Focus on the Mother

The influential call of "Where is the M in MCH?" of the mid-1980s helped focus attention on the "neglected tragedy" of maternal mortality and more generally on reproductive health[29]. Over 585,000 maternal deaths are estimated to occur each year; on average, more than one woman dies every minute of a pregnancy-related cause[5].

Maternal deaths are the tip of an iceberg of poor maternal health. Approximately 50 million women each year experience maternal health problems[30,31]. Pregnancy-related complications account for 18 percent of the global burden of disease among women of reproductive age. An estimated 40 percent of pregnant women will have some complication throughout their pregnancies. In addition, 15 percent of pregnant women may develop a potentially life-threatening complication requiring emergency obstetric services, which are often unavailable[32,33]. The burden of reproductive ill health is especially high for women in sub-Saharan Africa[31,34].

There is a large gap in maternal health outcomes between the developed and developing world[7]. The lifetime risk of maternal death (the product of the risk of maternal death and the average number of times a woman is likely to be pregnant) is as high as one in eight in some African countries. This is 150 times greater than the risk for a North American woman[9]. The death of a mother has many consequences, not least of which is the reduced probability of survival of her children. This is true for all infants, but girls are at even higher risk of dying if they lose their mothers[16].

Although most of the focus of interventions to reduce maternal mortality is on the antenatal and intrapartum periods, about two of every three maternal deaths occur in the postpartum period[12]. Maternal and newborn deaths both tend to occur in this same period, a fact that emphasizes the need to invest in systems that reduce both maternal and neonatal mortality by addressing the early postpartum and neonatal period.

D. Focus on the Mother *and* Baby



Although the immediate medical causes of maternal and perinatal deaths may differ, the underlying causes of these deaths are very similar. These causes include the inability to access quality maternal and newborn care, especially at delivery, and the low social status of women and newborns. Many of the conditions that result in complications for the mother during pregnancy, delivery, and after delivery also result in complications for the baby. Some of these are listed in Table 1.1, where the center column shows the maternal condition and the columns to the left and right show the potential effects on the mother and baby.

The dispersion of perinatal and maternal mortality over time is remarkably similar, and attention to the intrapartum and postpartum periods would benefit both mother and baby. The presence of a skilled birth attendant at delivery is associated with lower maternal deaths and newborn deaths[9,35,36]. Improvements in the health of mothers and babies are synergistic; interventions for the mother may reduce perinatal mortality by up to 75 percent, but many of these interventions also directly benefit mothers[8,37]. Efforts are required to strengthen the systems in which mothers and babies receive health care, so that communities and formal health care systems can work together to improve maternal and newborn health. The four systems causes of neonatal deaths are:

- poor pre-pregnancy health;
- inadequate care during pregnancy;
- inadequate care during delivery; and
- inadequate newborn/postpartum care.

These categories are the basis for the conceptual framework for causation of neonatal deaths (Figure 1.7), the BABIES assessment tool described in Part Two, and the Intervention Packages discussed in Part Four.

TABLE 1.1
ASSOCIATED ADVERSE MATERNAL AND NEWBORN OUTCOMES

POTENTIAL MATERNAL OUTCOME	MATERNAL CONDITION	POTENTIAL FETAL/NEONATAL OUTCOME
Infection during pregnancy	**Infection during pregnancy**	**Infection during pregnancy**
HIV/AIDS.	← HIV infection. →	Fetal death, IUGR, preterm birth, neonatal death, MTCT/HIV.
Puerperal sepsis, infertility, complications of syphilis.	← Syphilis infection. →	Preterm delivery, stillbirth, congenital syphilis.
Puerperal sepsis, infertility.	← Gonorrhea, chlamydia infection. →	Stillbirth, pneumonia, neonatal eye infection, blindness, preterm delivery (?).
Infections, especially after surgical procedures.	← Bacterial Vaginosis. →	Preterm delivery.
Anemia, increased likelihood of death if hemorrhage occurs.	← Malaria infection. →	Fetal death, IUGR, preterm birth in areas of unstable transmission.
Anemia	← Hookworm infestation. →	LBW due to IUGR and possibly preterm birth.
Poor nutrition during pregnancy	**Poor nutrition during pregnancy**	**Poor nutrition during pregnancy**
Death(?).	← Low pre-pregnancy weight, protein-calorie undernutrition while pregnant. →	Increased LBW and preterm birth.
Anemia.	← Folic acid deficiency. →	Stillbirth, neural tube defects, possibly congenital heart disease.
Night blindness, morbidity, death?	← Vitamin A deficiency. →	LBW, neonatal sepsis, increased MTCT/HIV (?).
Anemia, death due to hemorrhage.	← Iron deficiency. →	Risk of LBW due to IUGR and preterm birth, anemia, increased risk of infection.
Complications during delivery	**Complications during delivery**	**Complications during delivery**
Maternal infection leading to sepsis, potential infertility, death.	← Prolonged or premature rupture of membranes. →	Neonatal sepsis.
Convulsions cerebrovascukar accidents, death.	← Preeclampsia/eclampsia. →	Stillbirth, pre-term, asphyxia.
Prolonged labor, vaginal tears, uterine rupture, vesico-vaginal fistula, C-section, potential death.	← Malpresentation/obstructed labor. →	Meconium aspiration, asphyxia, birth trauma, sepsis, fetal-neonatal death.
Maternal infection, sepsis, tetanus, death.	← Unclean delivery. →	Neonatal infection, sepsis, tetanus leading to death.
Complications after delivery	**Complications after delivery**	**Complications after delivery**
Postpartum hemorrhage, breast engorgement, abscesses.	← Early breastfeeding not initiated. →	Hypoglycemia, hypothermia, jaundice, loss of benefit of antibodies in colostrum, reduction in breast milk volume.
Postpartum hemorrhage leading to shock or death.	← Retained placenta. →	Reduced attention and breast milk and potential loss of mother.
Sepsis.	← Postpartum infection. →	Reduced attention and breast milk and potential loss of mother.
Maternal "depletion syndrome" if too close especially if lactation and pregnancy overlap.	← Too frequent pregnancies. →	Higher perinatal mortality rate if pregnancies too close, increased risk of morbidity & mortality from abuse, neglect.

Notes: (?) indicates that the relationship is uncertain on available evidence. LBW = low birth weight. IUGR= in utero growth restriction. MTCT/HIV = mother-to-child transmission of HIV.

II. WHY HAVE PREGNANCY, CHILDBIRTH, AND THE NEWBORN BEEN NEGLECTED?

This section examines some of the reasons why newborn health has been neglected. The program manager may not have data about newborn deaths in the local setting for many reasons. However, an understanding of some of the common reasons that limit the availability of data and attention to newborn health will help the program manager to examine the problems in the local setting. The main reasons include the following.

A. Low Status of Women and Newborns

B. Invisibility

C. Inadequate Quality of Available Data

D. Institutional and Programmatic Gaps

E. Perceived Impossibility

A. Low Status of Women and Newborns

The value given to certain groups in society affects their access to resources that may be scarce, such as food, health care, and education. The amount of concern and public expenditure focused on a given health problem is often a reflection of the social status of those affected. In many of the settings with the highest maternal, fetal, and neonatal mortality, women have low status. Indicators, such as the gender ratio for literacy, demonstrate this social phenomenon. The proportion of illiterate women is greater than that of men in many of the least developed countries[38,39]. Gender inequality is also evident in infant mortality. The male-to-female ratio for infant mortality should be greater than 1.0 because of the natural survival advantage of the female infant. However, in many developing countries, it is less than 1.0, as the ratio test shows that more girls are dying than would be expected[40]. Reasons for this inequity in mortality rates include disparities in feeding practices and utilization of health care, as well as more obvious causes in some settings, such as female infanticide[41,42].

Newborns have even lower status than women and children and are often not considered to have "personhood" until later in the first year of life[43]. For instance, among the Akan peoples of West Africa, a baby is not named until the 40th day of life because so many are expected to die.

KEY QUESTIONS

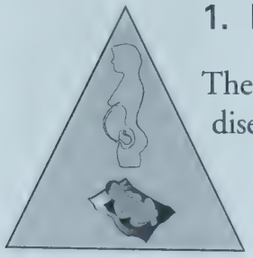
- ☞ Do women and newborns have poor social status in your area?
- ☞ Is the baby considered a person at birth or not until a naming ceremony?
- ☞ Is there a preference for boy babies, and are girl babies more likely to die?

B. Invisibility

Lack of data, one of the major barriers to recognition of the number of fetal-neonatal deaths, inhibits action to improve newborn survival. More data are needed at the international, national, and local levels. Currently both the quantity of data (coverage) and the quality of data (unreliable information on cause of death) are insufficient and unreliable. The invisibility of fetal-neonatal deaths in many developing countries results in a lack of interest and action, allowing the problem to remain largely unaddressed.

This invisibility existed globally until recently. Neonatal mortality has often been overlooked in policies and program implementation. For instance, neonatal mortality is rarely included on lists of major causes of death, even though the World Bank estimates that perinatal deaths account for approximately seven percent of the global burden of disease. The magnitude of the problem can be put in perspective by considering that neonatal mortality exceeds the combined global burden of disease due to malaria and all vaccine-preventable infections[32].

Reliable data are necessary not only to define a problem but also to choose appropriate interventions and evaluate their effectiveness. Difficulties with data are a major problem for newborn health programming. Even when national or local data are available, they are often not used to inform problem definition, to prioritize, or to evaluate interventions. Expensive cumbersome surveillance systems are not required. Simple techniques can translate easily collected data into useful information in order to manage health care decision-making at local and national levels. Some of these techniques will be discussed in Part Two of this manual.



1. Reliability of current global estimates

The World Bank estimate of seven percent of the total global burden of disease due to perinatal causes is an underestimation for two reasons.

The numbers of newborn deaths are underestimated. The World Bank calculations are based on 1996 WHO estimates of perinatal mortality rates (PMRs), which assume that 40 percent of both fetal and early neonatal deaths are not reported[9]. A review of the literature and an analysis of reported statistics suggest that PMRs are underreported by at least 60 percent, and possibly by as much as 500 percent in countries with higher death rates[17,44,45]. Hence, the actual numbers of perinatal deaths are likely to be considerably higher than the 1996 WHO estimate of 7.6 million a year.

Lack of information on perinatal morbidity. Consequently, the global burden of disease estimate for perinatal conditions is based solely on mortality. All of the other causes listed in the global burden of disease assessment included morbidity data[32]. Perinatal morbidity is a significant cause not only of short-term illness, but also of long-term physical and mental disability.

Even though the current data may represent a significant underestimate, the statistics are nevertheless staggering and require action.

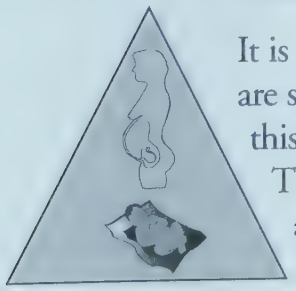
PANEL 1.1
LESSONS LEARNED

UNCOUNTED FETAL AND NEONATAL DEATHS IN THAILAND

A study in Thailand noted that the national PMR was officially 3.2 per 1,000 total births, lower than that in many developed countries although neonatal intensive care was not widely available. This community-based study in one province with a population of 80,000 found that none of the stillbirths and none of the early neonatal deaths were recorded. In contrast, 55 percent of infant deaths were registered. The study also reported that none of the babies who died (stillbirth, early neonatal deaths, or infant deaths) were registered at birth. Hence these babies were not included in the numerator (as deaths) or in the denominator (as stillbirths or live births) for the regional perinatal and neonatal mortality rates. Most of the deaths occurred at home, the families did not realize the importance of registration, and there were no incentives to promote registration.

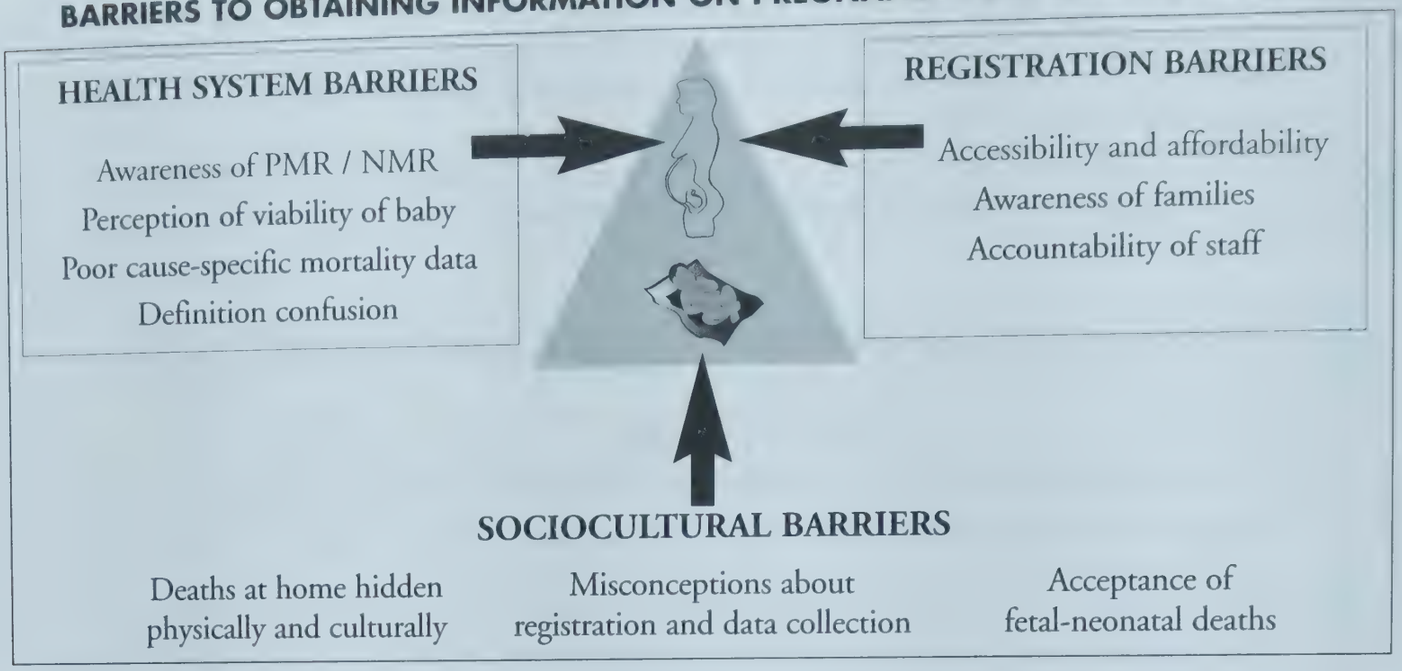
Source: Lumbig[44].

2. Barriers to data collection



It is believed that in many developing countries fetal and early neonatal deaths are significantly underreported, but there has been little systematic assessment of this. Studies, such as the one from Thailand, give us a snapshot of the problem. The main barriers to collecting data (Figure 1.2) on births and fetal, neonatal, and maternal deaths are sociocultural barriers, health system barriers, and barriers specific to vital registration of perinatal events.

FIGURE 1.2
BARRIERS TO OBTAINING INFORMATION ON PREGNANCY AND BIRTH OUTCOMES



Source: Lawn 1998

Sociocultural barriers: The invisibility of maternal and fetal neonatal deaths is often related to sociocultural beliefs and practices, including seclusion of women and newborns at home, acceptance of newborn deaths as normal, and often no perception of the newborn as a person. Recording events or collecting data is often not a priority in traditional societies and may be seen as futile if the baby dies. Many traditional cultures in Africa and Asia require a period of seclusion for the mother and the newborn after delivery (often for the first 40 days), during which time access to formal health care is limited[43]. Strong beliefs in the spirit world and fear that the baby or mother may be cursed can be very influential. In some settings, the mother is not allowed to mourn the death of the baby for fear of a curse affecting future babies. This taboo may also affect discussing and recording the death.

In many societies, there is also widespread acceptance of a high rate of fetal-neonatal deaths as normal[8]. Some ethnic groups in West Africa do not name their babies until 40 days of age, which may be a strategy used to cope with death rates that are the highest in the world. Infant deaths are more likely to be registered if the baby is bigger or if the death occurs after the critical age of acceptance for a given society – the age at which the newborn is viewed as a person[43,44]. In some countries, this acceptance comes after the seclusion period, whereas in others it comes after the naming ceremony. If a baby dies during this period and is not considered to have personhood, neither the birth nor the death may be reported.

Health system barriers: Barriers within the health system include the lack of motivation for staff to collect data and the selective collection of data when staff believe that the baby may not survive. Even when the event is recorded, confusion about definitions may alter the information. For example, a live birth may be recorded on the certificates as a stillbirth, or the cause may be incorrectly entered[46]. Subsequent coding of cause of death may introduce further error.

Medical perceptions of the viability of the baby influence whether the baby's birth and death are recorded. If the doctor or midwife thinks that the baby is unlikely to survive, the birth is less likely to be recorded. Even in settings with advanced neonatal care, both obstetricians and neonatologists tend to underestimate the survival chances of a preterm baby and thus reduce the level of care that is given to the mother and the baby[47].

The likelihood that a birth or death will be recorded is influenced by two factors:

- *Birth weight:* The smaller the baby, the less likely it is that the birth or death will be recorded. This is true even in many industrialized countries[48]; and
- *Age of the baby at death:* Fetal deaths are the least likely to be recorded[44]. Early neonatal deaths are less likely than infant deaths to be recorded. Some countries do not even record a live birth until the baby has survived the first 24 hours, a practice that reduces the NMR by about 40 percent[49].

Registration barriers: Registration is the civil government's process of recording births and deaths. In most developing countries, registration is the responsibility of the mother's relatives, but awareness of this fact is low among health care workers as well as families. Many barriers to registration exist, such as accessibility and affordability, either in direct cost or in terms of time lost traveling to the nearest town and waiting in line for a day[50,51]. Benefits of registration may not exist, or if the birth certificate is required for school entry, this may not be enforced.

Approximately two-thirds (66%) of the world's births are registered, although clearly there are great regional variations. The countries with the highest rates of newborn deaths often have the lowest rates of vital registration. Although efforts to improve civil registration is a long-term task and may not be a direct health service priority, such efforts eventually will provide better data as well as better civil rights for babies who will be afforded the simple dignity of being included on a record and being counted[40]. India has made dramatic progress in increasing birth registration, doubling coverage in some areas within a few years with the help of publicity campaigns.

KEY QUESTIONS

- What are the major barriers to collecting information on newborn health in your area?
- Do most deliveries occur at home or in institutions?
- Is there a time of seclusion for mother and baby?
- Does the health system collect data on births and fetal-neonatal deaths?
- Is there a functioning birth registration system in your area from which you can get data?

C. Inadequate Quality of Available Data

In addition to the lack of available data, the quality of existing data can be seriously compromised by several factors, including confusion in definitions and terminology, poor recording of birth weight and difficulties in attributing a cause of death in the newborn period.

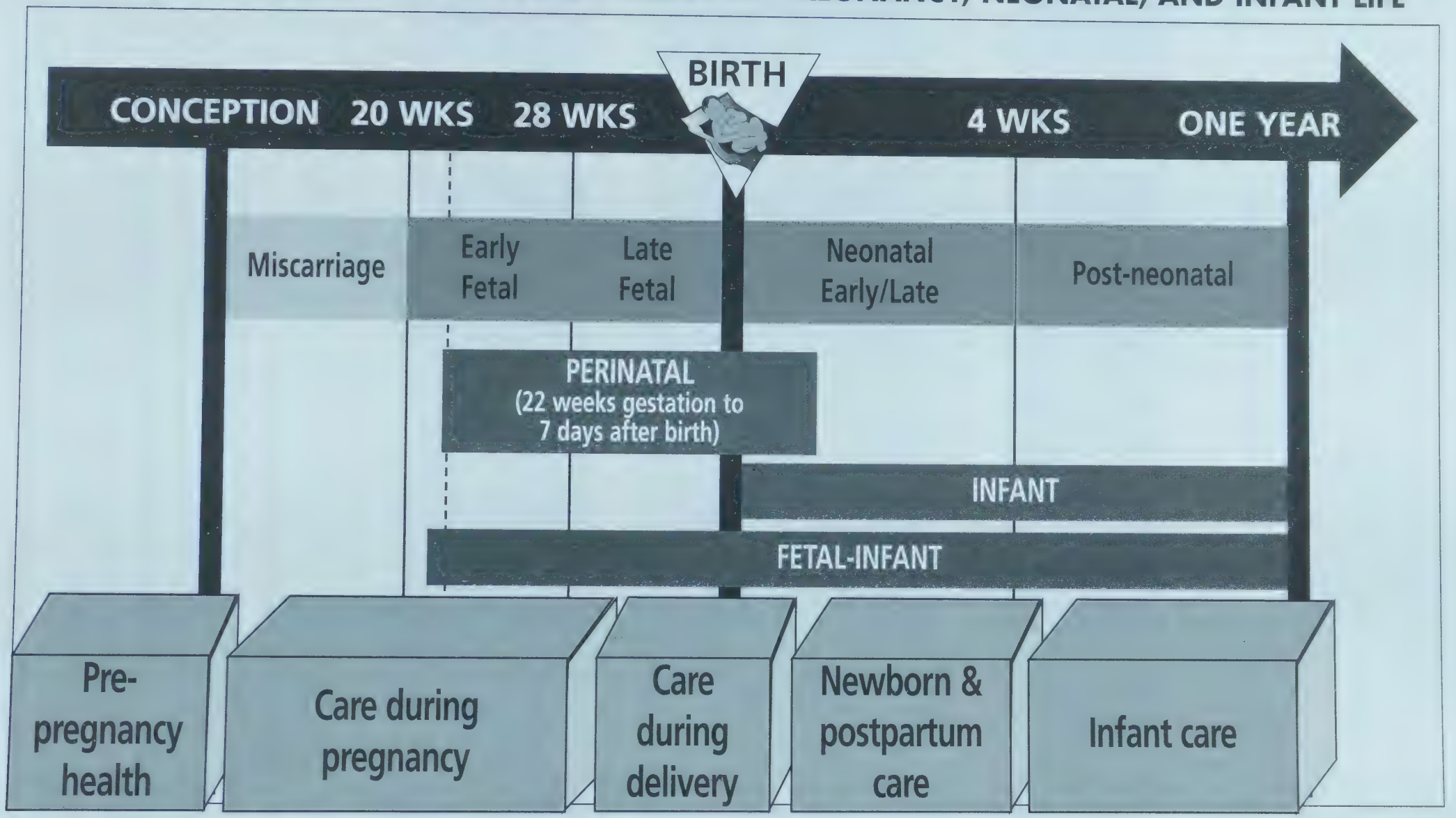
There is considerable confusion about the definitions and terminology for the perinatal and the neonatal periods[46,49]. Figure 1.3 shows the various time periods. The most common definitions for perinatal mortality apply to fetal and neonatal deaths in the following time periods:

- fetal deaths from 22 weeks to 40 weeks of gestation (equivalent to birth weight of 500 grams) and deaths among live births for days 0-7 of life (recommended in International Classification of Diseases (ICD)-10, used in industrialized countries);
- fetal deaths from 28 weeks to 40 weeks of gestation (equivalent to birth weight of 1 kg) plus deaths among live births for days 0-7 of life (WHO recommended for international comparison); and
- fetal deaths from 22 weeks to 40 weeks gestation plus deaths among live births (equivalent to birth weight of 500 grams) until the 28th day of life (traditional definition but not in common use now).

International comparability of data across countries is complicated by nonstandard definitions and highly variable application of definitions[46]. For the purposes of this manual, the ICD-10 definition of perinatal mortality is used (i.e., late fetal deaths from 22 weeks to 40 weeks and neonatal deaths in the first week of life). WHO usually refers to the expected weight at the given gestational age since gestational assessment is often not available.

Recording birth weight is important and very useful in attributing causes of newborn deaths. At present, birth weight is recorded in only about half of the world's births. Currently no countries in sub-Saharan Africa include birth weight on the death certificate. Clearly, for home deliveries without a skilled provider, rectifying this problem is more complex. There are several low-technology approaches to measuring birth weight, such as a hand-held spring balance that passes a mark if the baby weighs more than 2.5 kg (Program for Appropriate Technology in Health) or chest circumference tapes that are color-coded for low and normal birth weight[55]. (More details are given in Part Four under the "Extra Care of the LBW Baby Intervention Sub-Package.") However, as the proportion of deliveries attended by skilled personnel increases, the main issue will be not skill, but equipment, accountability, and recording.

FIGURE 1.3
INTERVENTION PACKAGE FOR TIME PERIODS OF PREGNANCY, NEONATAL, AND INFANT LIFE



Stillbirths = Babies born dead after 22 weeks of gestation (birth weight more than 500 g)
[Note: WHO recommends international reporting of fetal deaths only for those more than 28 weeks/(1 kg)]

Identification of the specific causes of fetal-neonatal deaths is often unreliable, partly because many causes of these deaths present with similar clinical signs and symptoms, such as poor feeding and thermal instability[52]. A correct diagnosis often requires a skilled clinical health care provider and laboratory facilities. Even in developed countries where such services and technology are available, difficulties in diagnosis persist, particularly for fetal deaths. Even if an appropriate diagnosis can be made, the information may be erroneously recorded and coded in the medical records or in civil registration data[46]. The ICD codes for fetal and neonatal deaths are extremely complex and often require investigative procedures that are unavailable. The lack of specific data on the cause of death may mislead health policy makers about which interventions will have the greatest impact. A number of word-based autopsy tools for infants have been validated, but the ones that have included neonatal causes of death either have numbers too low to validate or have had poor specificity except for neonatal tetanus[53,54].

KEY QUESTIONS

- What are your national definitions for fetal, perinatal, and neonatal mortality?
- Might small babies who die in your area be unrecorded?
- Is cause-specific mortality for fetal-neonatal deaths available in your area? If so, how reliable do you think it is? (i.e., do many neonatal tetanus deaths occur at home?)

D. Institutional and Programmatic Gaps

Attention and funding directed at care for the mother are still inadequate, given the size of the problem[56]. International attention and resources for the newborn seem lost in the gap between the Safe Motherhood and the Child Survival programs. For example, none of the "Safe Motherhood Action Points" include the newborn, and the Integrated Management of Childhood Illness protocols currently start after 1 week of age[57,58], by which time about 40 percent of infant deaths have occurred. Apart from the WHO landmark document, the "Mother-Baby Package"[59], few integrated approaches have been proposed. The best answer is not a new vertical program for the newborn but greater focus on and integration of existing programs while keeping the mother and baby together.

KEY QUESTIONS

- Do you have Safe Motherhood and Child Survival activities in your area?
- Do either of these activities have goals/programs that address newborn health or ways that newborn health programming could be integrated?

E. Perceived Impossibility

It is a common misunderstanding among the international health community that expensive technology is needed to save newborn lives[60-64] and that inexpensive interventions cannot be applied effectively in low-resource settings. There are two strong arguments against this belief. First, history shows that in developed nations NMR and PMR fell dramatically before neonatal intensive care units were functioning. Most of this decline resulted from better obstetric care (especially from skilled attendants at delivery) and from better routine newborn care, as well as general improvements in maternal health[35,36,65].

The second argument is that the evidence of current local successes indicates a growing list of simple, relatively inexpensive interventions that can save newborn and maternal lives in developing countries. Despite this fact, most of these interventions have not been effectively implemented on a large scale[59,66-68]. Examples of effective interventions to address fetal-neonatal mortality include tetanus toxoid (TT) vaccine to prevent neonatal tetanus, treatment of maternal syphilis (particularly to reduce late fetal deaths), antimalarial prophylaxis to reduce LBW and preterm birth[69], and clean delivery care. Although there are successful examples of community-based care, especially for safe motherhood, only a handful involve the newborn[70-73]. Lack of dissemination of information about these successes relating to the newborn has prevented their replication. Many of these successes will be highlighted in Part Four.

KEY QUESTIONS

- ☞ In your area, do health care personnel and community members believe that newborn lives can be saved?
- ☞ Are health care providers aware of evidence-based practices that improve newborn care? If not, how could this information be shared?
- ☞ Are there babies who have survived complications, such as severe infection or preterm birth, that can be used as examples to show that survival is possible?

III. MAGNITUDE OF FETAL-NEONATAL MORTALITY

The magnitude of global fetal and neonatal mortality is overwhelming with approximately eight million deaths occurring each year[1]. As postneonatal causes of infant death have declined, neonatal mortality has become increasingly apparent. Although the common image of newborn care is intensive care for very preterm infants, the vast majority of newborn deaths in developing countries could be prevented with simple, low-technology interventions. Fetal-neonatal deaths are closely related to maternal health and to access to quality maternal and newborn health care. The major direct causes of fetal-neonatal death include birth asphyxia, infections, and complications of preterm birth.

In this section the following aspects of fetal-neonatal deaths are discussed:

A. How Many Fetal-Neonatal Deaths Occur?
B. When Do Infants Die?
C. Where in the World Do Newborns Die?
D. Where in the Health Care System Do Newborns Die?

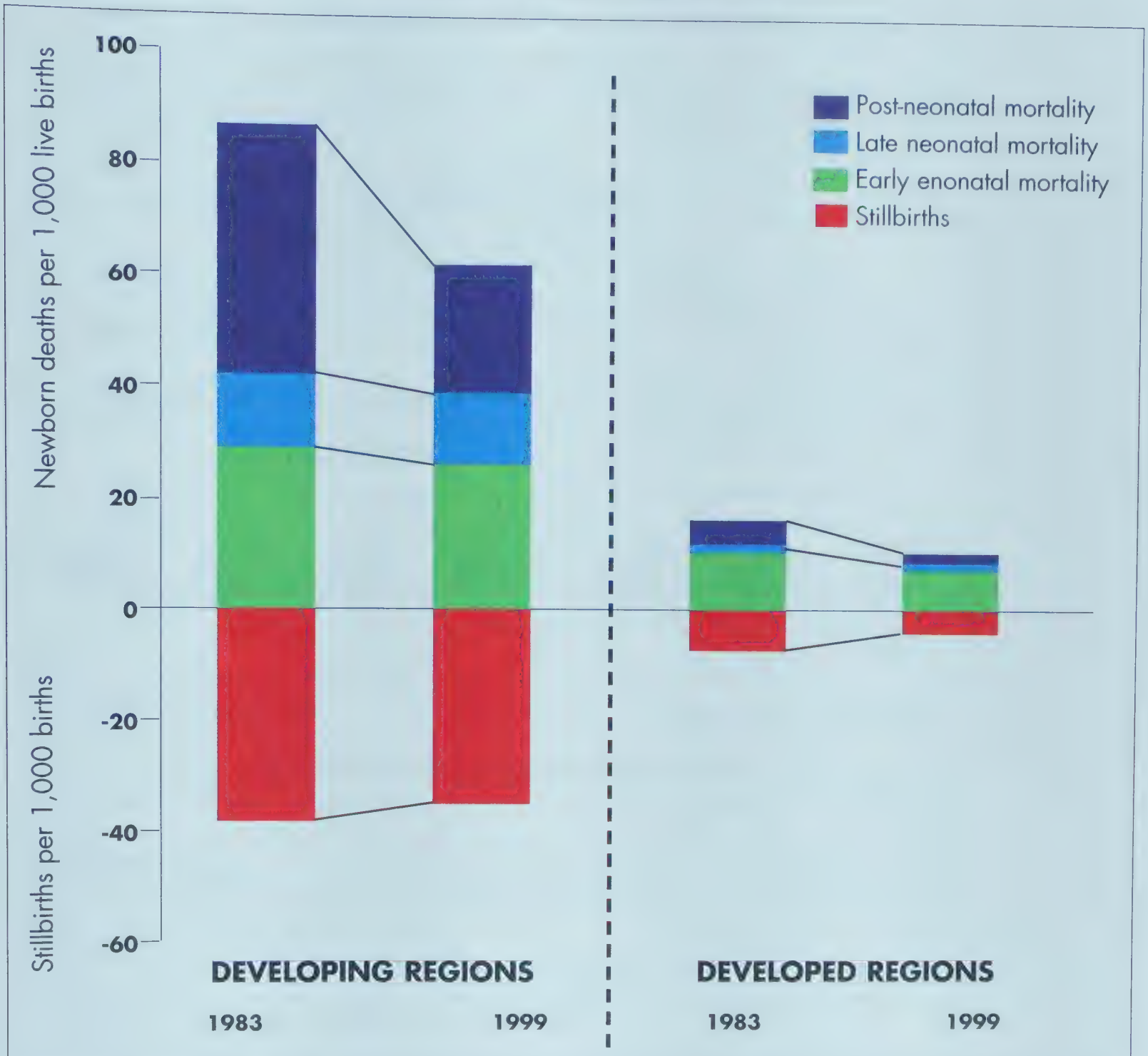
A. How Many Fetal-Neonatal Deaths Occur?

Conservative estimates from WHO suggest four million stillbirths and four million neonatal deaths occur each year[1]. Allowing for changes in rates, this means that in the last decade, over 900 million newborns – a number similar to the entire population of India – were either stillborn or died before the 28th day of life.

The global burden of disease due to perinatal causes exceeds that of malaria and all vaccine-preventable infections combined. (World Bank 1993)

Over the last decade, programs targeting specific childhood illnesses, such as diarrhea and acute respiratory tract infections, along with higher immunization coverage and better management of illness in children have contributed to a significant decline in infant mortality rates in many developing countries. The average infant mortality rate worldwide has dropped from 95 per 1,000 live births in 1983 to 60 per 1,000 live births in 1995. The greatest reduction was due to improvements occurring between 2 and 12 months of life, or the postneonatal period[4,8,60,65]. Unfortunately, some of this progress is being affected by the HIV epidemic, especially in regions of sub-Saharan Africa. In contrast to decreases in postneonatal mortality, neonatal and fetal deaths have remained almost unchanged in many developing countries (Figure 1.4.). Neonatal deaths, and especially early neonatal deaths, now represent a much larger proportion of the overall total infant mortality rate (Figure 1.4). This proportion will continue to rise as postneonatal mortality falls[74].

FIGURE 1.4
CHANGES IN LATE FETAL, NEONATAL AND POST-NEONATAL MORTALITY RATES 1983 TO 1999



Source: WHO presentation at "Neonatal Survival Intervention Research Workshop," Kathmandu, Nepal, April 29-May 3,[20]
NOTE that stillbirths and neonatal death rates have fallen much less than the post-neonatal mortality rates and so account for a bigger proportion of the deaths.

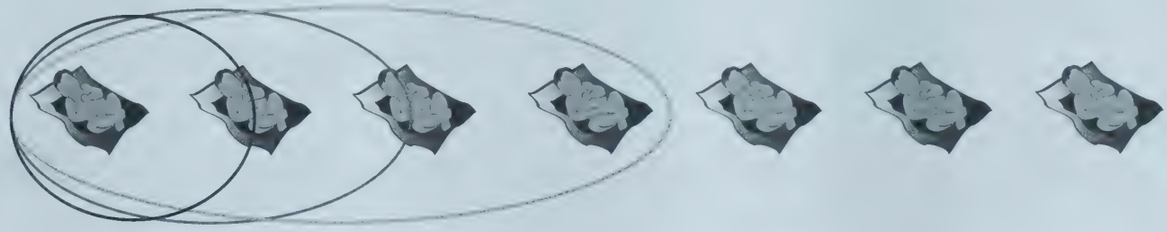
B. When Do Infants Die?

Of the world's estimated seven million infant deaths per year, approximately two-thirds occur in the neonatal period. Many deaths occur during the early neonatal period, particularly during the first day (Figure 1.5), an indication that the intrapartum period and the first 24 hours are the most critical period for infant survival. Long-term disability is also strongly influenced by this crucial period[8].

FIGURE 1.5
WHEN DO INFANTS DIE?

The Infant Mortality "Two-thirds Rule"

1. Almost 66 percent of infant deaths occur in the first month of life.
2. Among those who die in the first month of life, over 66 percent die in the first week of life.
3. Of those who die within the first week, approximately 66 percent die in the first 24 hours of life.



First day **First week** **First month** **Months 2-12**

Each baby represents one million infant deaths

Source: Based on Hill[4] and WHO estimates[1].

There are an estimated 11 million fetal and infant deaths each year. In general, about 70 percent of these deaths are in the fetal and neonatal period (8 million globally)[1].

Late fetal deaths (28 weeks of gestation to birth; 4 million annually): In many settings, fetal deaths or stillbirths are under recorded, but they can often be estimated by using the ratio of stillbirths to early neonatal deaths, which is usually 1:1. Thus, if the number of deaths during the first week of life is known, the number of late fetal deaths will normally be about equal to this number. In some situations, such as high rates of syphilis infection, there may be more stillbirths than early neonatal deaths. Sub-Saharan Africa is reported to have a higher ratio of stillbirths to early neonatal deaths, which may be associated with a high prevalence of syphilis and malaria as well as poor access to emergency obstetric care.

Early neonatal deaths (0 - 7 days postpartum; 2.9 million annually): The neonatal period and especially the first 24 hours of life is a crucial time for the newborn. Approximately 66 percent of neonatal deaths and 40 percent of infant deaths occur in the first week of life. The major causes of early neonatal deaths are asphyxia, infection, complications of prematurity, and birth defects[1].

Perinatal deaths (late fetal and early neonatal deaths; 6.9 million annually): Perinatal deaths include both late fetal and early neonatal deaths, a grouping that avoids difficulties in different interpretations of whether a baby was a live birth or not. In addition, late fetal and perinatal deaths have very similar causes.

Late neonatal deaths (8-28th day of life; 1.1 million annually): Late neonatal deaths account for approximately 16 percent of infant deaths. The major cause is infections but preterm birth and small-for-gestational age babies are at higher risk of dying during this period.

Neonatal deaths (0 – 28th day of life; 4 million annually): Neonatal mortality now accounts for the majority of infant deaths (60%) and thus far has received relatively little attention and resources.

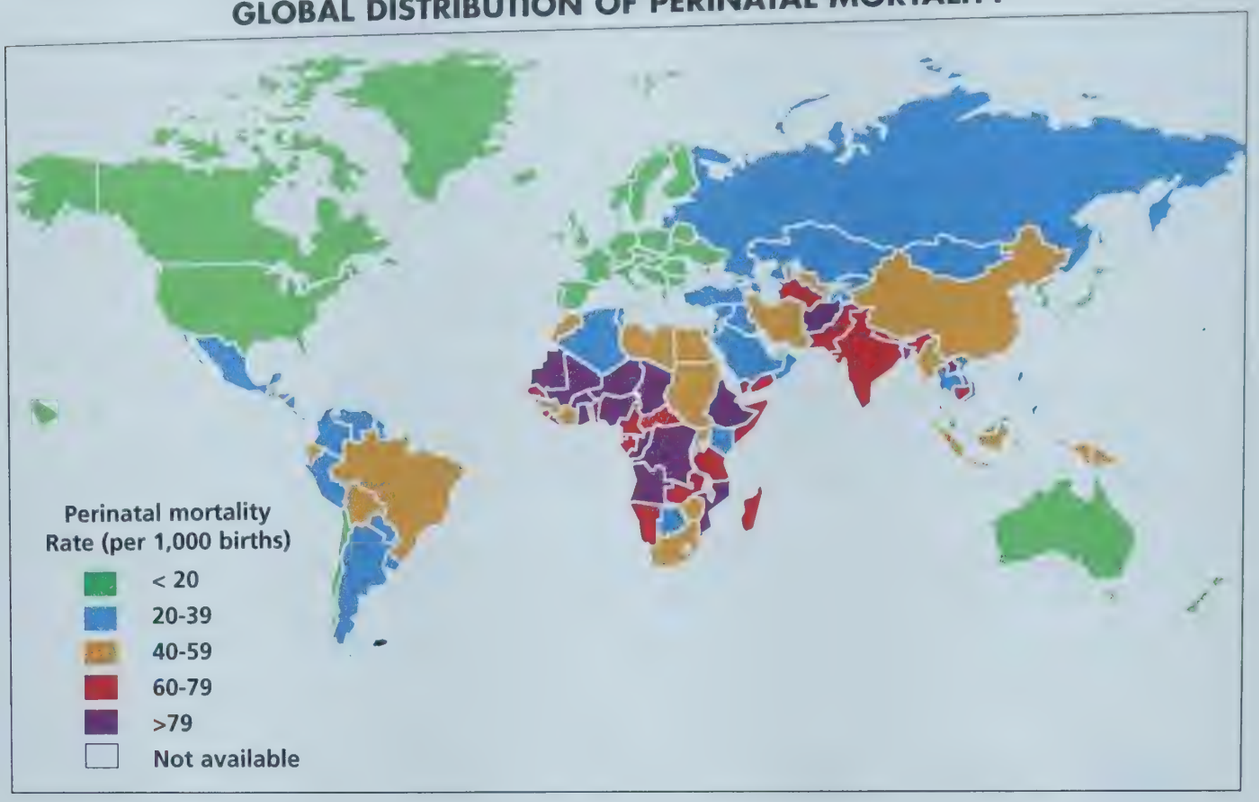
Postneonatal deaths (1 - 12 months after birth; 3 million annually): In developing countries, poor living conditions contribute to malnutrition, disease, and high rates of death among infants. Postneonatal mortality is being reduced in many countries as a result of a combination of improved living standards and interventions, such as immunization[68]. Unfortunately, the HIV epidemic in sub-Saharan Africa has reversed some of these gains in child survival. Globally, only approximately 25 percent of fetal/infant mortality occurs in the postneonatal period, and this proportion is expected to fall.

Despite the fact that most infant deaths occur in the neonatal period, child survival programming and funding continue to focus on the postneonatal period and often target specific diseases (i.e., diarrhea, acute respiratory tract infection) rather than long-term health. A paradigm shift is needed in both the timing and the focus of interventions. Programming also needs to emphasize the early neonatal period, focusing on asphyxia, tetanus, and neonatal sepsis as well as infections in the late neonatal and postneonatal period. This approach would reduce mortality in the neonatal period while improving health in the postnatal period and beyond. Maternal outcomes would also benefit, as mortality trends over time for the mother mirror those of the baby. Approximately two-thirds of maternal deaths are in the postpartum period, and about thirty percent are in the first 24 hours after delivery[12,75].

C. Where in the World Do Newborns Die?

Ninety-eight percent of perinatal deaths (late fetal and early neonatal) occur in developing countries (Figure 1.6). Perinatal mortality is highest in Africa where the average is 76 per 1,000 total births, and in some areas it is as high as 200 deaths per 1,000 total births – more than 20 times the rate in Western Europe[1,2]. Although perinatal mortality rates are lower in Asia (53/1,000), 60 percent of all neonatal deaths (about 2.6 million) occur on that continent. This higher proportion is due to the sheer magnitude of Asian populations and numbers of births, particularly in India and China.

FIGURE 1.6
GLOBAL DISTRIBUTION OF PERINATAL MORTALITY



Source: WHO / FRH / MSM / 96.7 data[2].

The geographical distribution of neonatal mortality rates is similar to perinatal rates with the rates higher in Africa (42/1,000) followed by Asia (34/1,000). Most neonatal deaths occur in Asia because of the large population.

It is should be stressed that *all* of these figures are based on estimates. Many countries with the highest death rates have the lowest rates of both birth and death registration. As a result, these countries have little information on newborn health. For example, Ethiopia has a perinatal mortality rate greater than 80 per 1,000 total births and no system for birth registration. In Bangladesh, the PMR is also above 80, and less than 30 percent of births are registered. In comparison, Thailand has a PMR of 20-39 per 1,000 total births, and at least 90 percent of the births are registered[17].

KEY QUESTIONS

- In your setting, do you have an estimate of the numbers of late fetal and neonatal deaths? If not, you may be able to calculate a rough estimate from national rates applied to the number of births in your area. If your national rate is not known, WHO has estimates of rates per country for 2001, and NMR may be available in the State of the World's Newborns report. Part Two gives more details on how to use available data or collect selected data to understand the number and causes of fetal-neonatal deaths in your area.
- If the majority of infant deaths are in the neonatal period, are there interventions in place to prevent these deaths?

TABLE 1.2
PERINATAL AND NEONATAL MORTALITY BY REGION

Region	Estimated number of live births per year (thousands) 1999	Estimated neonatal mortality rate (per 1000 live births) 1999	Estimated number of neonatal deaths
World	**129,596**	**31**	**4,035,000**
More developed regions	**13,045**	**5**	**65,000**
Less developed regions	**116,550**	**34**	**3,970,000**
Africa	**28,685**	**42**	**1,205,000**
Eastern Africa	10,057	41	408,000
Middle Africa	4,107	39	162,000
Northern Africa	4,607	32	147,000
Southern Africa	1,277	18	23,000
Western Africa	8,636	54	465,000
Asia	**76,090**	**34**	**2,561.000**
Eastern Asia	21,106	20	421,000
South - Central Asia	38,442	46	1,753,000
Souther - Eastern Asia	11,432	24	277,000
Western Asia	5,110	22	110,000
Europe	**7,374**	**6**	**44,000**
Eastern Europe	3,001	9	27,000
Northern Europe	1,074	4	4,000
Southern Europe	1,405	5	8,000
Western Europe	1,895	3	5,000
Latin America/Caribbean	**11,553**	**17**	**196,000**
Caribbean	773	19	15,000
Central America	3,427	13	46,000
South America	7,354	18	135,000
Northern America	4,098	4	18,000
Oceania*	**225**	**34**	**8,000**
Melanesia	192	39	7,000
Micronesia	18	6	< 1,000
Polynesia	15	8	< 1,000

*Japan, Australia and New Zealand are excluded from the regional estimate but are included in the total for developed countries. NMR is based on WHO estimates for 2001[1]. Estimated numbers of neonatal deaths were calculated using the estimated births per year for 1999 (UNICEF, State of the World's Children 2001).

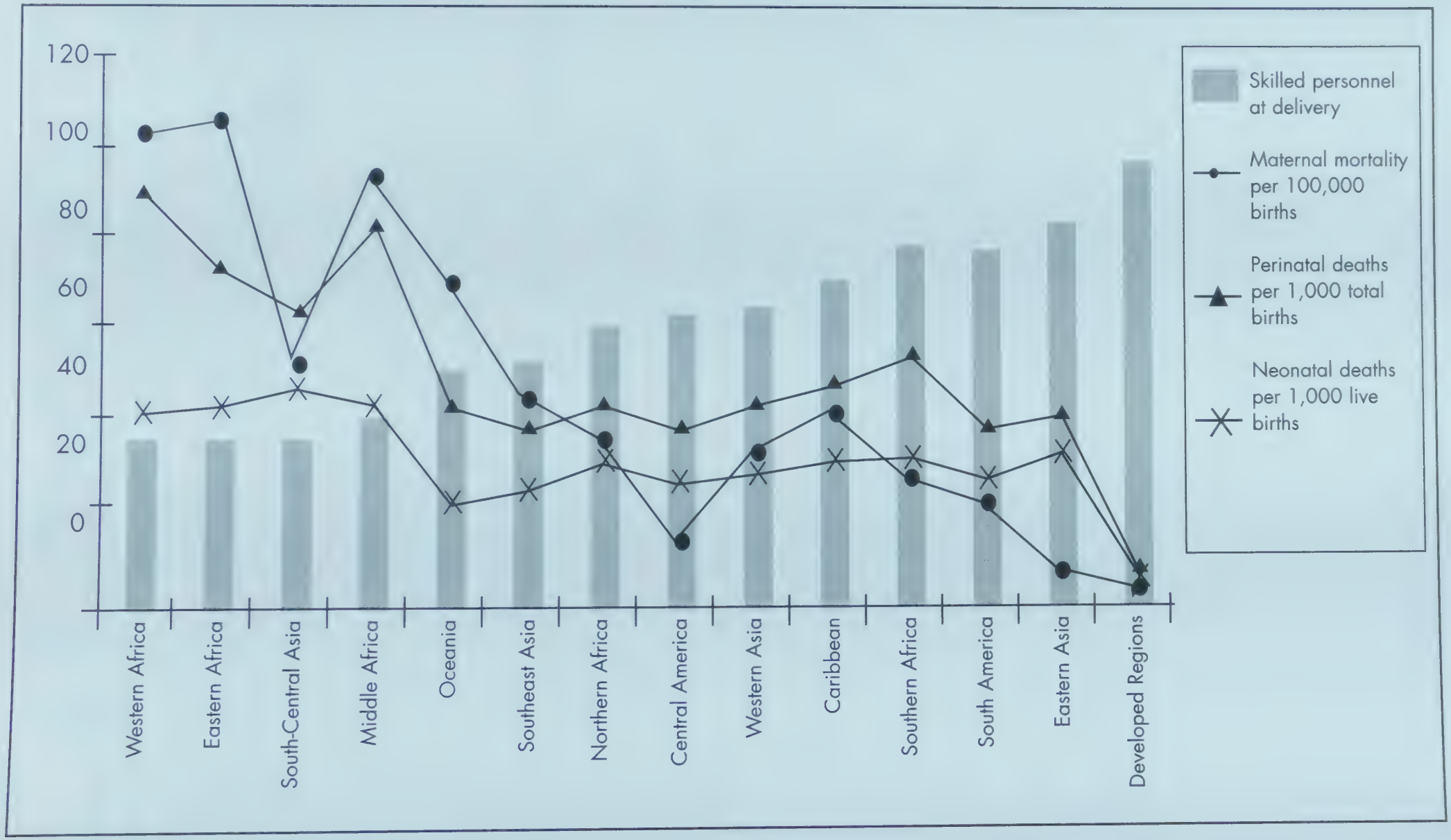
D. Where in the Health Care System Do Newborns Die?

Many fetal-neonatal deaths occur at home, often without the presence of a skilled attendant. Only about one-third (37%) of deliveries in developing countries take place in a health care facility. In addition, about half (53%) of all pregnant women deliver with the assistance of a skilled attendant[6]. As the proportion of deliveries with a skilled attendant increases, both maternal and perinatal deaths decrease (Figure 1.7). In considering skilled attendant coverage or the percentage of institutional births, it is important to remember that these proportions are averages; many subpopulations, such as those in rural areas and the peri-urban poor, have much lower coverage. Often these populations are the most likely to have high rates of maternal and fetal-neonatal death. The World Bank and Demographic and Health Surveys are producing a series of documents that describe a variety of indicators, such as immunization coverage by income quartile (available from the World Bank Website at www.worldbank.org). Some services, such as immunization coverage, are fairly constant across income groups. However, skilled attendance at birth varies most with income, ranging from 20 percent for the poorest to 90 percent for the richest[76].

KEY QUESTIONS

- In your setting, what proportions of deliveries occur in institutions or at home?
- Do you have an estimate of what proportion of deliveries is with a skilled attendant?
- Are there certain groups of people (rural areas, poorer people, and different ethnic groups) that are less likely to deliver with a skilled attendant?

FIGURE 1.7
PROPORTION OF DELIVERIES WITH A SKILLED BIRTH ATTENDANT, RELATED TO MATERNAL, PERINATAL, AND NEONATAL MORTALITY



Source: Adapted from Koblinsky[75] with using WHO data[2]

IV. WHY DO NEWBORNS DIE?

This section discusses the causes for neonatal and, to a lesser extent, fetal deaths. Discussion of fetal deaths is limited by the lack of information. There are several conceptual frameworks describing factors related to maternal mortality and child mortality. Understanding fetal and neonatal deaths can build on these frameworks, particularly the importance of delay as a contributory cause. Newborn deaths result from a combination of medical causes, social factors, and systems failures that vary by context and culture. Therefore, this section is organized as follows.

A. Conceptual Framework

B. Direct Medical Causes of Fetal-Neonatal Deaths

1. Direct medical causes of fetal deaths.
2. Direct medical causes of neonatal deaths.
3. Low birth weight and preterm birth.

C. Underlying Causes of Fetal-Neonatal Deaths

1. Inadequate pre-pregnancy health.
2. Inadequate care during pregnancy.
3. Inadequate care during delivery.
4. Inadequate newborn care (essential, extra, and emergency).

D. Delays in Access that Contribute to Fetal-Neonatal Deaths

1. Delays in problem recognition within the home.
2. Delays in deciding to seek care.
3. Delays in reaching the health facility due to lack of transport and resources.
4. Delays in receiving appropriate, quality care at the facility.

E. Fundamental Causes of Fetal-Neonatal Deaths

1. Newborn outcomes as a marker for women's health and social status.
2. Traditional care practices in the home and the community.

The following sections will discuss each of these factors in detail. The BABIES tool described in Part Two also uses the underlying causes of fetal-neonatal deaths (pre-pregnancy health care, care during pregnancy, care during delivery and newborn care) to help the program manager prioritize interventions. The Intervention Packages covered in Part Four are based on these categories, including examples of lessons learned.

TERMINOLOGY

MATERNAL AND NEWBORN HEALTH SERVICES

Basic emergency obstetric care (BEmOC): The ability of a health institution to perform manual removal of retained placental/pieces; assisted vaginal delivery (i.e., vacuum extraction), as well as the ability to administer antibiotics, sedatives (i.e., Valium, Magnesium Sulfate) and oxytocics (i.e., Ergometrine, Pitocin) IM or IV and IV fluids. It is recommended that there should be four basics EmOC facilities per 500,000 people.

Care during pregnancy (antepartum): Care throughout pregnancy until the onset of labor, including care both at home and in the formal health care system, such as in an antenatal clinic.

Care during delivery (intrapartum): Care from the onset of labor until the delivery of the placenta.

Comprehensive emergency obstetric care (CEmOC): The ability of a health instituion to perform all the Basic EmOC functions, as well as the ability to perform surgery under general anesthesia, assisted removal (i.e., D&C) of retained placental pieces, and provide blood replacement. It is recommended that there should be one Comprehensive EmOC facility per 500,000 people.

Emergency newborn care: Identification, stabilization, and management of sick babies with conditions such as neonatal sepsis, asphyxia, and jaundice.

Essential newborn care: Basic preventive care for all newborns, especially warmth, cleanliness, breastfeeding, cord and eye care, and immunizations.

Extra newborn care: Identification of and additional support for babies who are born weighing less than 2,500 grams. Mortality rates for babies with birth weight 1,750-2,500 grams can be improved significantly with simple interventions. Babies weighing less than 1,750 grams at birth are likely to require more specialized care. May also apply to other babies who are not LBW, but have other special requirement, such as babies born to HIV positive mothers.

Fresh stillbirths: Fetal deaths that occur within the uterus less than 12 hours before delivery and are mainly caused by complications during labor and delivery (asphyxia).

Macerated stillbirths: Fetal deaths that occur within the uterus more than 12 hours before delivery and so appear more disintegrated and with broken skin. These deaths are most commonly due to maternal syphilis, other infections, and congenital abnormalities.

Newborn (or neonatal) care: Care from birth until the 28th completed day of life, including care both at home and in the formal health care system.

Postpartum care: Care from the delivery until the sixth completed week after delivery, including care both at home and in the formal health care system.

Pre-pregnancy health: The health of the woman before she becomes pregnant.

Skilled attendant: Individuals with "midwifery skills (i.e., doctors, midwives, and nurses) who have been trained to proficiency in the skills to manage normal deliveries, diagnose and manage or refer complicated cases."[77] Although trained traditional birth attendants are not included, this does not mean that they cannot play a role in promoting maternal and newborn health.

TERMINOLOGY

FOR THE SMALL BABY

Assessment of gestational age of baby: The gestational age of a baby can be assessed by use of:

- ultrasound assessment in utero (the gold standard but unavailable in most developing countries);
- the last menstrual period, which will be less accurate in societies where prolonged lactational amenorrhea is common or where calendars are not used; and
- clinical assessment of gestation after delivery, using a variety of scores. The well-validated scores are fairly complex and require considerable skill. Simpler scores are available and give moderately accurate assessments.

Assessment of size of baby: The size of the baby can be assessed by means of:

- foot sole size;
- tape measurement of chest, head, arm;
- spring scales; and
- balance scales (more details in Figure 4.7).

Intermediate LBW (ILBW): (Also called moderate LBW.) Birth weight of 1,500–2,499 grams.

Intrauterine growth restriction (IUGR): IUGR is a process of growth restriction during pregnancy that results in the birth of a baby who weighs less than expected for gestation. This process may be due to inadequate nutrition, infection (such as malaria), or other reasons. Not all growth-restricted babies are LBW. For example, a baby may weigh more than 2,500 grams but have the potential to have weighed more. Hence, the rate of IUGR will be higher than the LBW rate.

Low birth weight (LBW): Birth weight less than 2,500 grams (caused by IUGR and/or preterm birth).

Preterm birth: Birth before 37 completed weeks of gestation.

Small for gestational age (SGA): SGA refers to a baby who's weight is less than the 10th percentile for gestation and gender. This term is often used as a proxy for IUGR because of the difficulty determining the "expected weight for gestation and gender." However, some babies who are SGA may not have been growth restricted but are simply inherently small and would normally be under the 10th percentile.

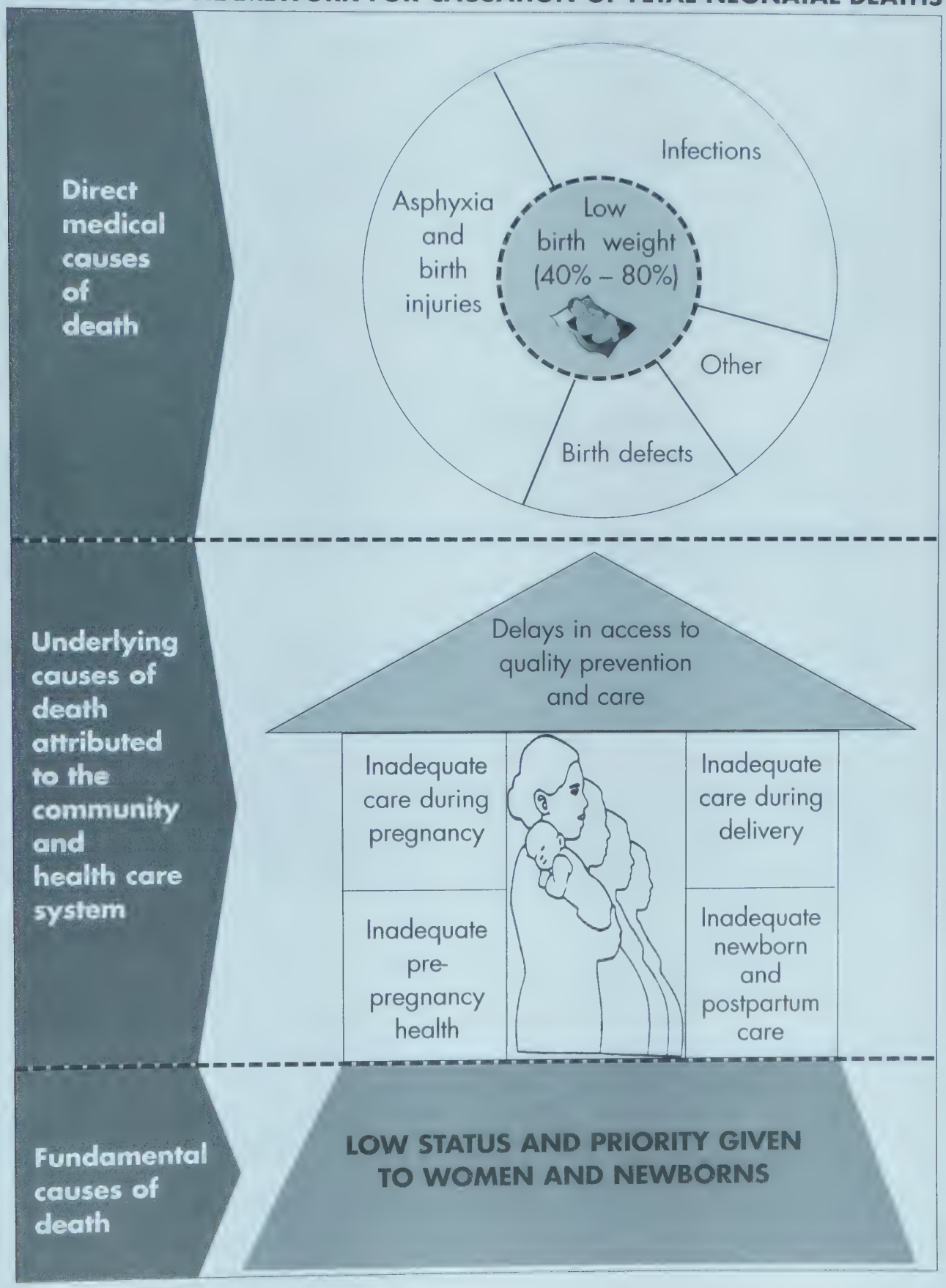
Very LBW (VLBW): Birth weight less than1,500 grams.

Source: WHO, ICD[9] and ICD[10], UNSCN 2000[24].

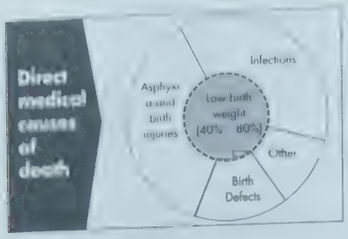
A. Conceptual Framework

There are many conceptual frameworks that articulate various aspects of maternal mortality. Others articulate factors related to child mortality, which may or may not include newborn mortality. However, there are very few frameworks that show the inter-relationship between the mother and the newborn, as well as their health outcomes. Experience has shown that there are several factors that can influence the type of outcomes that a woman and her newborn may experience. Figure 1.8 is a simplified conceptual framework that outlines the factors and their relationships that affect maternal and neonatal mortality.

FIGURE 1.8
CONCEPTUAL FRAMEWORK FOR CAUSATION OF FETAL-NEONATAL DEATHS



Source: Lawn 2000



B. Direct Medical Causes of Fetal-Neonatal Deaths

This section discusses the three main causes of fetal-neonatal deaths.

1. Direct causes of fetal deaths.
2. Direct causes of neonatal deaths.
3. Low birth weight and preterm birth.

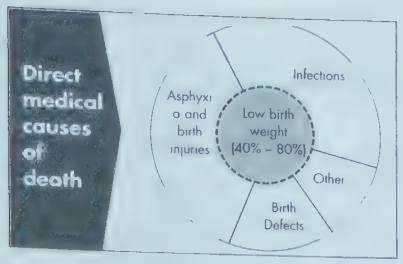
There is a lack of community-based data on causes of fetal-neonatal deaths, many of which occur at home. For this reason, the top three causes of death (infections, birth asphyxia, and birth defects) are listed without attributing percentages.

Low birth weight, especially that due to preterm birth, is a major contributing factor to fetal-neonatal deaths. It is included in the center of the diagram of medical causes (Figure 1.8). Between 40 percent and 80 percent of neonatal deaths occur among babies who were born weighing less than 2,500 grams[78]. It is often difficult to classify neonatal deaths due to specific causes because many neonatal conditions have nonspecific symptoms, such as poor feeding and lethargy. Stillbirths are more difficult to classify, even with sophisticated technology. Table 1.3 summarizes the current information on major causes of fetal-neonatal deaths.

TABLE 1.3
MAJOR CAUSES OF FETAL-NEONATAL DEATH

Late fetal deaths (28 weeks up to delivery)	Early neonatal (0 - 7 days)	Late neonatal death (8 - 28 days)
Fresh stillbirth • Intrapartum birth asphyxia • Preterm birth • Birth defects	• Birth asphyxia/birth injuries • Infection – Sepsis – Meningitis – Tetanus – Acute lower respiratory infection – Diarrhea	• Infections – Sepsis/meningitis – Meningitis – Tetanus – Acute lower respiratory infection – Diarrhea
Macerated stillbirth • Infection, especially syphilis • Hypertension/preeclampsia • Placental abruption • Birth defects • Maternal diabetes • Post-term pregnancy (more than 42 weeks gestation)	• Complications of preterm birth (respiratory distress, jaundice, increased risk of sepsis) • Birth defects	• Early feeding failures (more common for preterm and LBW babies) • Infanticide/neglect
Estimated annual total 4 million	2.9 million	1.1 million

Source: Wigglesworth 1980[80], Stoll, B. 1997[91], Hovatta, O et al 1983[79], Huang DY 2000[80], WHO 2001[1], Child Health Research Project, 1999[66], Van Dam, 1995[82].



1. Direct medical causes of fetal deaths

A late fetal death or stillbirth is the death of a baby before birth. These deaths refer to fetuses that are at least 22 weeks of gestational age and shows no signs of life at delivery.

Even with careful pathological investigation, a specific cause cannot be attributed to 25-50 percent of stillbirths[79,80]. Furthermore, in most of the world, pathological investigations are extremely rare. Most fetal deaths are unrecorded and uninvestigated. The simplest classification for stillbirths is by their appearance at birth, either fresh or macerated, which determines time of death[81].

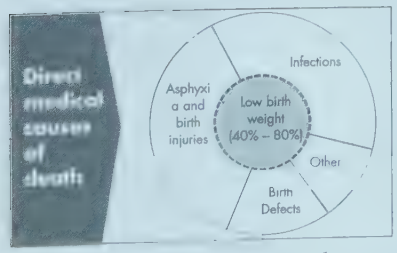
> ***Fresh stillbirths*** are deaths that occur within the uterus less than 12 hours before delivery and are due almost exclusively to intrapartum asphyxia.
>
> ***Macerated stillbirths*** are deaths that occur within the uterus greater than 12 hours before delivery, therefore appearing more disintegrated and with broken skin.

The fresh/macerated classification for stillbirths is used at all reporting levels, including national reporting in some countries, such as Malaysia, and at the local level in diverse settings in sub-Saharan Africa and South Asia. For example, health center delivery log books in rural Tanzania often include a column for macerated/fresh stillbirths.

Maternal sexually transmitted infections (STIs) are a major, preventable cause of stillbirth. The consequences of STIs on the fetus and newborn can be devastating. STIs can cause spontaneous abortion, LBW, congenital abnormalities, neonatal infections, and blindness[68,82]. STIs are discussed further on pages 1.40 through 1.44. Additionally, Part Four outlines interventions for STIs as part of the Pre-pregnancy Health Intervention Package and Care During Pregnancy Intervention Package.

KEY QUESTIONS

- ☞ In your setting, what information is available about fetal deaths?
- ☞ Does the institutional delivery log book record fetal deaths, and if so, are they categorized as fresh or macerated? The fresh stillbirth rate can be an estimate of the rate of asphyxia during delivery. A high rate of macerated stillbirths would prompt you to investigate the need for syphilis screening during pregnancy.



2. Direct medical causes of neonatal deaths

These deaths are most commonly due to maternal syphilis or other infections and congenital abnormalities[81] (Table 1.4). Information and estimates are available for neonatal deaths, although much of the available estimates are based on hospital data, which may not be representative. Table 1.4 summarizes the global estimates, issued by WHO in 2001, based on 1999 data.

TABLE 1.4
ESTIMATES OF NEONATAL MORTALITY BY MAJOR CAUSES

Cause of death	Percentage (%)	Number of deaths/year
Birth asphyxia/trauma	29	1,160,000
Pneumonia	24	960,000
Prematurity	15	600,000
Congenital anomalies	10	400,000
Neonatal sepsis	8	320,000
Neonatal tetanus	5	180,000
Other	5	200,000
Diarrhoea	1	40,000
TOTAL	100	4,000,000

Source: WHO, 2005[1]. Numbers calculated assuming four million neonatal deaths.

Asphyxia and birth injuries: *Every year, up to six million newborns need resuscitation at birth, and about 1.2 million die of birth asphyxia/trauma*[67,85]. Risk factors for birth asphyxia identified in a prospective study in a hospital in Nepal included:

- multiple births (odds ratio = 22);
- meconium-stained amniotic fluid (odds ratio = 18);
- prolonged rupture of membranes (odd ratio = 3.8);
- malpresentation (odds ratio = 3.4); and
- first pregnancy (odd ratio = 2.0).

Older maternal age and shorter maternal height were also associated with birth asphyxia, but no specific cut-offs were described as predictive[84]. In Nepal, a study of 151 infants who were asphyxiated showed that, of the 78 percent that could be found at one year of age, 44 percent had died (generally in the first few days), and 18 percent had major impairments, mainly spastic hemiplegic cerebral palsy[84,85]. Therefore, it is evident that birth asphyxia causes significant disability and death.

Approximately one third of babies who need resuscitation do not have obvious danger signs, so it is critical that skilled providers be equipped and trained to perform simple and effective neonatal resuscitation at every delivery[67,86,87]. Implementation of standardized resuscitation protocols can be highly effective in reducing neonatal mortality[88]. Unfortunately, there is little information on the effect of simple resuscitation at the community level[89,90].

Infections: *Every year, an estimated 30 million newborns acquire a neonatal infection, and 1–2 million neonates die from infection*[91]. These infections include neonatal tetanus, sepsis, and acute lower respiratory tract infections. Some infections, notably tetanus, are preventable by immunization. The umbilical cord is a major source of infection in the early neonatal period, accounting for the majority of neonatal tetanus infections and many cases of neonatal sepsis[92]. Simple clean cord care is an important intervention strategy that can prevent many cases of neonatal sepsis and tetanus, yet many babies do not benefit from this simple intervention[93].

A baby with neonatal sepsis in sub-Saharan Africa is not only more likely to develop sepsis but is also 8-80 times more likely to die than a baby in Europe with a similar condition[96]. This discrepancy in survival is caused by delays in accessing quality maternal and neonatal services. The major organisms that cause neonatal sepsis in industrialized countries are different from those in the developing world. Group B beta-hemolytic Streptococcus has become the major organism causing neonatal sepsis in the developed world, whereas Pneumococcus, E. coli, and Staphylococcus are the predominant causes in developing countries[91,96]. This finding has significant treatment implications, particularly for antibiotic selection and sensitivity[97].

Each year an estimated 300,000 babies, typically between the ages of 3 and 14 days of life, die from neonatal tetanus[1]. In 1989, the World Health Assembly called for the elimination of neonatal tetanus. Yet it is still a major threat to newborn survival in many places. The countries with the highest number of estimated cases are listed in Table 1.5. Neonatal tetanus is seriously underreported, with only about three percent of cases recorded, largely because the condition is more common among poor rural communities where data collection is least likely to be efficient.

TABLE 1.5
COUNTRIES WITH THE HIGHEST ESTIMATED NUMBERS OF NEONATAL TETANUS CASES

Bangladesh	China	Ethiopia
Uganda	Indonesia	India
Nepal	Nigeria	Pakistan
Somalia	Sudan	D.R. Congo

Reference: UNICEF, Maternal and Newborn Tetanus Elimination by 2005. New York: UNICEF, 2000.

Tetanus has a very high case fatality rate, with around 90 of every 100 victims dying. Treatment is difficult, even in settings where intensive care is available. Hence, prevention is the key to reducing these deaths[93-95]. Preventive measures include maternal tetanus toxoid coverage, clean deliveries, and appropriate cord care. These interventions are detailed in Part Four, and additional references are provided on the CD-ROM.

Birth defects: *Each year around 400,000 babies die and unknown millions are disabled due to birth defects.* Although birth defects are a leading cause of neonatal deaths in developed countries, they are estimated to cause only about ten percent of deaths in developing countries[83,98]. Since this is a much smaller percentage than deaths due to infections and asphyxia, programs concerned with preventing neonatal deaths should focus on congenital abnormalities that are common and cost-effective to prevent[1,100], such as:

- neural tube defects, many of which are preventable by preconception folic acid;
- cretinism, preventable by adequate maternal iodine intake, often achieved by iodinization of salt; and
- congenital rubella syndrome disabilities, preventable by rubella immunization[101-108].

Other causes of neonatal deaths include:

- *Hypothermia,* defined as a rectal temperature of less than 36°C (98°F), can occur rapidly in a newborn, even at moderate environmental temperatures. This can happen due to a baby's large ratio of body surface area to body mass and to poor thermal insulation. A baby left wet while the placenta is delivered is especially vulnerable. The effects of hypothermia are potentially severe and contribute to illness and death, especially in preterm babies. Standard care guidelines advise early drying and thermal protection of the newborn, a warm delivery room, and other efforts to maintain the "warm chain"[109]. In a Nepali hospital, even though staff had been extensively trained on this topic, 80 percent of newborns were hypothermic[110,111]. A seven-country evaluation of newborn thermal control knowledge and practices of health care professionals found that both knowledge and practices related to hypothermia were frequently inadequate[112]. Skin-to-skin care of LBW infants, called "kangaroo care," was first developed in Colombia in 1978 and has been subjected to clinical trials in hospital settings. This care is more effective than incubators for thermoregulation of medically stable LBW infants, with a 30 percent reduction in the rate of serious illness for LBW babies in hospitals[113]. However, the intervention has not been systematically evaluated for home care. Kangaroo care is described in more detail in Part Four.

- *Hypoglycemia* is defined as a blood sugar level less than 2.2 mmol/L. Severe hypoglycemia increases the risk of death, although this is complex to investigate since hypoglycemia is often caused by conditions, such as neonatal sepsis or asphyxia, that also cause death. Even moderately low blood sugar in the first few days of life has been linked to long-term reduction in intelligence[114]. Moderate hypoglycemia is a surprisingly common event, even in apparently well babies. Asymptomatic hypoglycemia was found in 80 percent of well babies in a hospital in Nepal, many of whom were LBW[115]. The key issue in prevention of hypoglycemia is early and exclusive breastfeeding and extra attention with LBW babies. This attention applies especially to preterm babies, who may need cup feeding or tube feeding with expressed breast milk initially because they may be too immature to breastfeed effectively. Because even simple screening tests for detecting hypoglycemia (such as blood sugar testing sticks used for diabetics) are unavailable in many settings, this condition is often missed.

- *Jaundice* in the neonatal period may cause death and long-term disability, especially severe cerebral palsy. Two main types of jaundice are seen in the first week of life:

  - Physiological jaundice arises 48 - 72 hours after birth and usually resolves by the fifth day. This condition occurs in about half of normal birth weight babies and 90 percent of preterm babies and has no serious consequences.

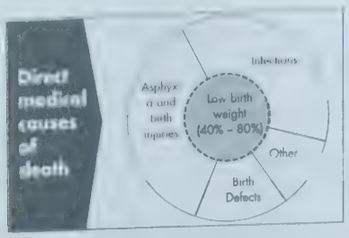
- Pathological jaundice may start in the first 24 hours after birth and worsens rapidly because of the breakdown of red blood cells. Common causes are blood group incompatibilities, particularly ABO or Rhesus, and abnormal red blood cells in the baby. Abnormal red blood cells can occur with glucose-6 phosphate dehydrogenase deficiency (G6PD), which is relatively common in some parts of Africa and South Asia. Early treatment with phototherapy can often prevent serious complications, but only if the jaundice is recognized early and appropriate care is given. Quality care of severe neonatal jaundice is difficult to achieve without an investigation of the level of bilirubin, and this test is often unavailable.

Vitamin K deficiency can cause bleeding in an infant in the first weeks of life. This is known as hemorrhagic disease of the newborn. Many babies are born with a lack of Vitamin K, which is necessary for blood to clot. The newborn may present with bleeding after circumcision, from the cord or the gut (vomiting blood or bleeding out of the rectum). Intracranial bleeding is the most dangerous effect of hemorrhagic disease of the newborn. Colostrum has high levels of Vitamin K but often is not given. Exclusively breastfed babies may not develop the bacteria in the gut that synthesizes Vitamin K and so may be more at risk of Vitamin K deficiency[116]. Part Four discusses current policies regarding prevention of hemorrhagic disease of the newborn. Policy discussion is limited by the lack of data on the incidence of hemorrhagic disease in developing countries[117].

Many of the causes of fetal-neonatal deaths are highly preventable, especially in the two largest categories — infections and asphyxia. Yet simple preventive measures are not practiced for many of the world's newborns.

KEY QUESTIONS

- ☞ Is neonatal tetanus common?
- ☞ Do you have information (i.e., incidence, types of organism) on neonatal sepsis?
- ☞ Do many babies die of asphyxia (are there many normal birth weight babies who die from asphyxia)?
- ☞ Are particular birth defects common (i.e., neural tube defects, Downs Syndrome)?
- ☞ Do you have local policies for simple newborn care, such as clean delivery, cord care, eye care, and breastfeeding support?



3. Low birth weight and preterm birth as an important cause of fetal and neonatal deaths.

Low birth weight is defined as a birth weight less than 2,500 grams. Every year, approximately 20 million LBW babies are born[1]. These births represent about 16 percent of the world's births[1,12,112]. LBW babies can be categorized as one or more of the following:

- preterm babies (born before 37 weeks);
- babies with intrauterine growth restriction (IUGR) who are full term; and
- babies who are preterm and growth restricted.

Although LBW is not an immediate cause of death, it is a major contributing factor and jeopardizes the newborn's chances of survival. This is why it is in the center of the medical causes of death shown in Figure 1.8. Birth weight is one of the best predictors of neonatal mortality[119,120]. Studies estimate that preterm birth and IUGR may be underlying causes in 40 to 80 percent of neonatal deaths[119]. A growth-restricted baby born at full term is two to three times more likely to die than a normal birth weight, term baby. However, a moderately preterm baby (32-37 weeks of gestation) has a 6–20 times higher mortality rate[119]. A severely preterm baby (less than 32 weeks gestation) has up to a 100 percent chance of dying, depending on gestation and the care available. To reduce mortality in this small group of babies, high-tech care is required. Mild and moderate preterm birth (32–37 weeks of gestation) does not carry as high a risk of death, but it is much more common. Hence, mild to moderate prematurity accounts for a significant number of neonatal deaths that are also more preventable than deaths in severely preterm babies[121].

This section will discuss the key issues related to low birth weight and preterm birth, which include global variation in LBW, causes of LBW, and strategies to reduce deaths for LBW babies.

Global variation in low birth weight: The rate of LBW differs markedly around the world and even within countries. Most (97%) LBW babies are born in developing countries (Table 1.6). The highest rates of LBW are in South Asia, which accounts for about 54 percent of all LBW babies, and about 80 percent of these LBW babies are believed to be full term (between 37 and 42 weeks of gestation)[18]. In South Asia, about 70 to 80 percent of neonatal deaths occur among LBW babies[153].

However, even in sub-Saharan Africa, where LBW is on average about 15 percent, certain subpopulations have much higher rates. Local information is therefore needed to guide decision-making.

TABLE 1.6
ESTIMATED LBW PREVALENCE AND NUMBERS BY REGION (1995 - 1999)

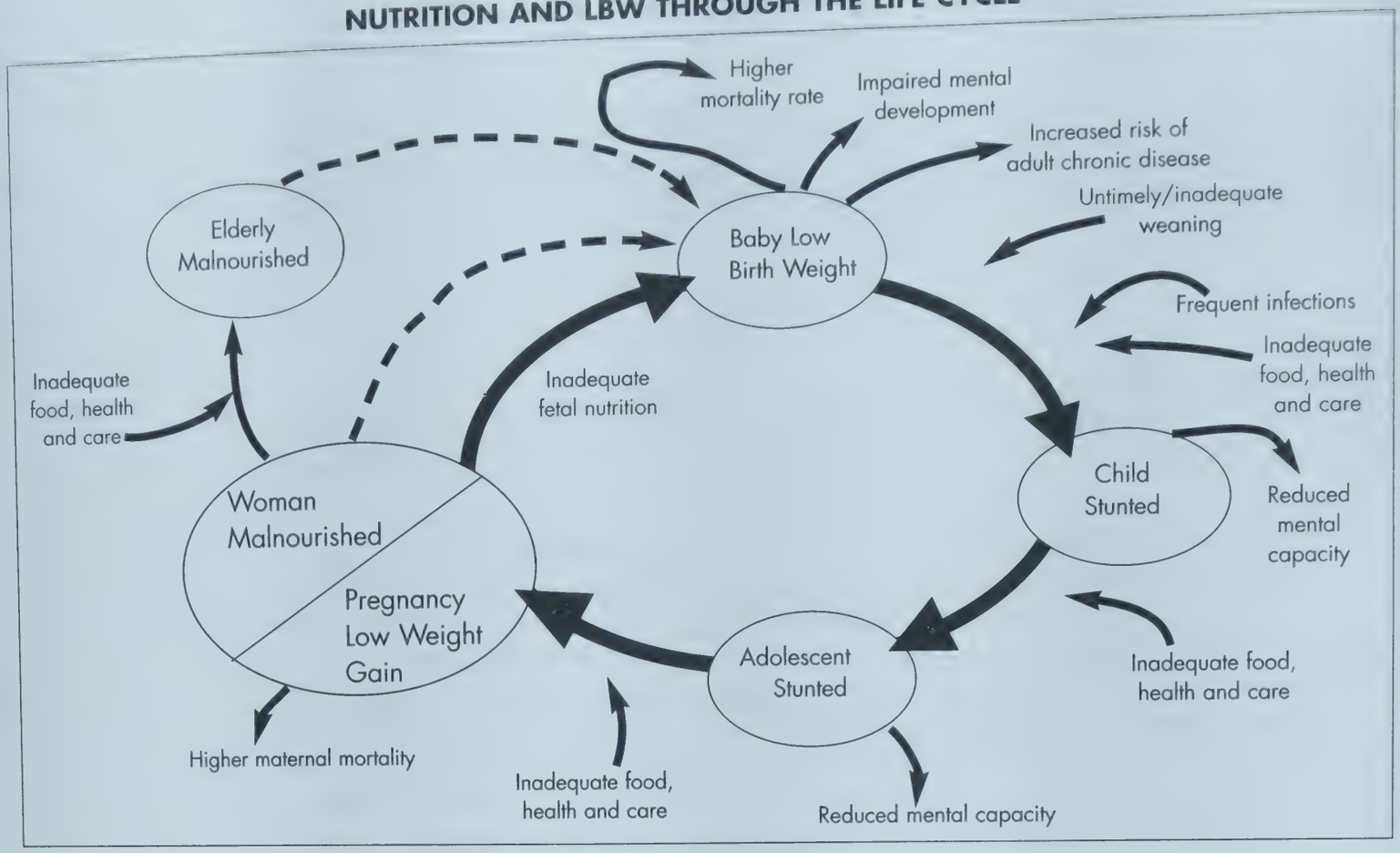
Country	LBW rate	LBW number	Percentage of the world's LBW babies per region
World	16%	20,368,200	-
Developed countries	6%	586,080	2.9%
Developing countries	17%	19,782,120	97.1%
Sub-Saharan Africa	15%	3,606,600	17.7%
Mid-East and North Africa	11%	1,023,660	5.0%
South Asia	31%	11,061,110	54.3%
East Asia and Pacific	8%	2,611,360	12.8%
Latin America and Caribbean	9%	1,031,040	5.1%
CEE/CIS and Baltic States	7%	448,350	2.2%

Source: UNICEF, 2001[27].

Causes of low birth weight: LBW may be due to the baby's being born too soon (preterm birth), too small (IUGR), or too soon and too small. Much of the literature on LBW assumes that most cases of LBW in developing countries are due to IUGR in term babies. Kramer's meta-analysis found that preterm birth and IUGR were both more common in developing countries than in industrialized countries and that IUGR was the predominant identified cause of LBW[119]. He estimated the rate of IUGR in term babies to be approximately 16 percent in developing countries and almost seven percent in industrialized countries. In addition, the study found the rate of preterm birth was seven percent in developing countries and three percent in industrialized countries. More recently, de Onis and colleagues found IUGR to be the predominant cause of LBW in developing countries[118]. One limitation of these findings is that they are largely based on data using last menstrual period to assess gestational age, which may affect the proportion of LBW cases attributed to preterm birth. Even in industrialized countries, there has been an apparent rise in the preterm birth rate over the last decade, an increase believed to be due to better assessment of gestational age[122].

The single most significant cause of IUGR globally is poor nutrition among women of reproductive age throughout the life cycle (Figure 1.9)[123]. The Institute of Medicine recommends an additional 530 calories per day for pregnant women. Unfortunately, many pregnant women do not have access to this level of nutrition. Undernutrition in pregnancy can be exacerbated because women are often expected to maintain a heavy workload in the fields and household, including child care duties. Other causes of IUGR include maternal infection, particularly malaria, and conditions such as hypertensive disorders in pregnancy. Smoking is a potentially preventable cause of LBW, especially in industrialized countries[119,124].

FIGURE 1.9
NUTRITION AND LBW THROUGH THE LIFE CYCLE



Source: ACC/SCN[24].

The causes of preterm birth are often unknown, but the major identified reasons are infections, such as bacterial vaginosis, syphilis, and malaria, and obstetric or medical complications of pregnancy, such as hypertension, multiple pregnancy, and placental abruption. The disease burden due to preterm birth is particularly difficult to assess. At present, only about half of the world's babies are weighed at birth, and far fewer are assessed for gestational age. Antenatal ultrasound is the "gold standard" for assessing gestational age, but is unavailable for most women. Relying on the date of the woman's last menstrual period is accurate if this date is known and if the woman has a regular menstrual cycle close to 28 days. In settings where women often breastfeed until their next pregnancy, the last menstrual period may be unknown or the woman's cycle may be irregular, which may make this method unreliable. The baby can be examined after delivery to assess gestational age by evaluating physical and/or neuromuscular development, but even simplified methods for doing this require training and skill[125]. In many cases, the preterm baby will die of another specific cause, such as infection or asphyxia, and so the effect of the preterm birth may not be recorded.

Ways to address the LBW:

There are two approaches to reducing neonatal deaths in LBW babies.

- *Reduce the LBW rate:* If the rate of LBW is greater than 15 percent in a region or country, it is recommended that LBW be a major public health priority[118]. Depending on the local causes of LBW, this is likely to require long-term investment, especially given the intergenerational effect of the causes of LBW throughout the life cycle (Figure 1.9). For certain causes of LBW, a more immediate impact may be seen. For example, giving presumptive treatment sulphadoxine-pyrimethamine (SP, known as Fansidar) to pregnant women in their third trimester is associated with increased birth weight and up to 40 percent reduction in neonatal death[69,126].

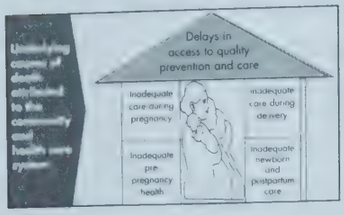
  Although a few research projects have demonstrated improvements in birth weight with nutritional interventions, this has not been documented on a large scale[127,128]. Many of the issues require major behavioral change, such as reducing the workload for pregnant women or addressing the cultural belief that "eating down" in pregnancy will prevent the delivery of a big baby. Although this may seem challenging, the gains from reducing LBW rates would amply justify efforts to develop and implement packages to address this problem. Although much of the impact may be beyond the usual three- to five-year cycle for program management, preventing LBW is an important goal that will continue to improve health and well-being for generations.

- *Improve the chances for survival of babies with LBW:* Although it may take a long time to reduce the LBW rate, the number of deaths among LBW babies could be significantly reduced by improving care in the first hours and weeks of life, especially for term IUGR babies and moderately preterm (32-37 weeks). Extra attention to warmth, support for breastfeeding, cleanliness, and early identification and management of illness could result in low-cost improvements in survival. One hospital in Ghana had more than a 30 percent reduction in the mortality rate for LBW babies by paying attention to these simple principles of care (Panel 4.18). Another simple evidence-based approach is giving steroid injections to mothers in preterm labor. This intervention reduces by 40 percent the risk of severe neonatal respiratory problems related to immaturity of the lungs. Also, it is an inexpensive (about US $1.00) and feasible intervention that is applicable to low- and high-resource settings.

Specific interventions for both approaches are discussed in Part Four. Reducing the LBW rate is covered in the Pre-Pregnancy Health and Care During Pregnancy Intervention Packages. Interventions to address improving survival of LBW babies are covered in the Extra Care of the LBW Baby Intervention-Sub Package.

KEY QUESTIONS

- Do you have an estimate of the LBW rate in your area? Even a hospital-based estimate is better than no data. What proportion of neonatal deaths occur among LBW babies?
- What proportion of LBW babies are full term versus preterm?
- What are the major causes of IUGR or preterm birth in your setting? Is it feasible to address any of them now, such as presumptive treatment of malaria in pregnancy?



C. Underlying Causes of Fetal-Neonatal Deaths

Any intervention to prevent fetal deaths must focus on the mother. This is also true for many of the causes of neonatal deaths. The majority of neonatal deaths (around 66%) occur in the first week of life, and direct causes of death, such as asphyxia, respiratory distress in a preterm baby, and early sepsis, are related to the health or care of the mother. The main causes of neonatal deaths are poor pre-pregnancy health and inadequate care during pregnancy and delivery. Newborn care is also important in preventing neonatal deaths, particularly essential care of the normal newborn to prevent illness, extra care of LBW babies, and access to quality emergency care for the sick newborn.

Postpartum care of the mother is also crucial. Most maternal deaths occur in the immediate postpartum period. Thus, integrating care for mother and baby during this important period is vital to reducing mortality for both. The death of a mother also has a direct impact on the newborn's long-term chances of survival[16]. There are socioeconomic consequences for surviving children because women are more likely than men to spend their income on family welfare. A Tanzanian study found that children are more likely to drop out of school or miss school after the death of a mother [6,129]. Since the main focus of this manual is the newborn, postpartum care of the mother will not be discussed in detail. Overall goals will be outlined in Part Four, and the aim should be to integrate postpartum and newborn care.

1. Inadequate pre-pregnancy health

The health of women of reproductive age is a critical determinant of pregnancy outcomes for both mother and newborn. Birth weight and the gestational age of the baby are the two strongest determinants of fetal and infant outcome and are largely determined by the health of the mother[78]. However, improvement in the health of women of reproductive age requires long-term input and often behavioral changes in nutrition, education, sexual behavior, and health care seeking practices. Maternal health affects the baby through the mother's poor nutrition, infections, and lack of pregnancy spacing, especially starting with teenage pregnancies.

Unmet need for family planning: Family planning improves fetal and newborn outcomes as well as maternal health in general[130]. An analysis of Demographic and Health Survey data from 17 countries suggests that meeting unmet need for spacing of pregnancies could reduce perinatal and neonatal mortality by about one-quarter while also reducing the LBW rate[54].

Undernutrition among women of reproductive age: The single most important cause of IUGR globally is poor nutrition among women of reproductive age[123]. (The importance of nutrition throughout the life cycle is illustrated in Figure 1.9.) Possible interventions of protein-energy and micronutrient supplementation are covered in Part Four as part of the Pre-Pregnancy Health and Care During Delivery Intervention Packages.

Infections among women of reproductive age: Many infections affect women of reproductive age in developing countries, but reproductive health outcomes are particularly influenced by STIs. Identification and treatment of STIs are often difficult for many reasons, including:

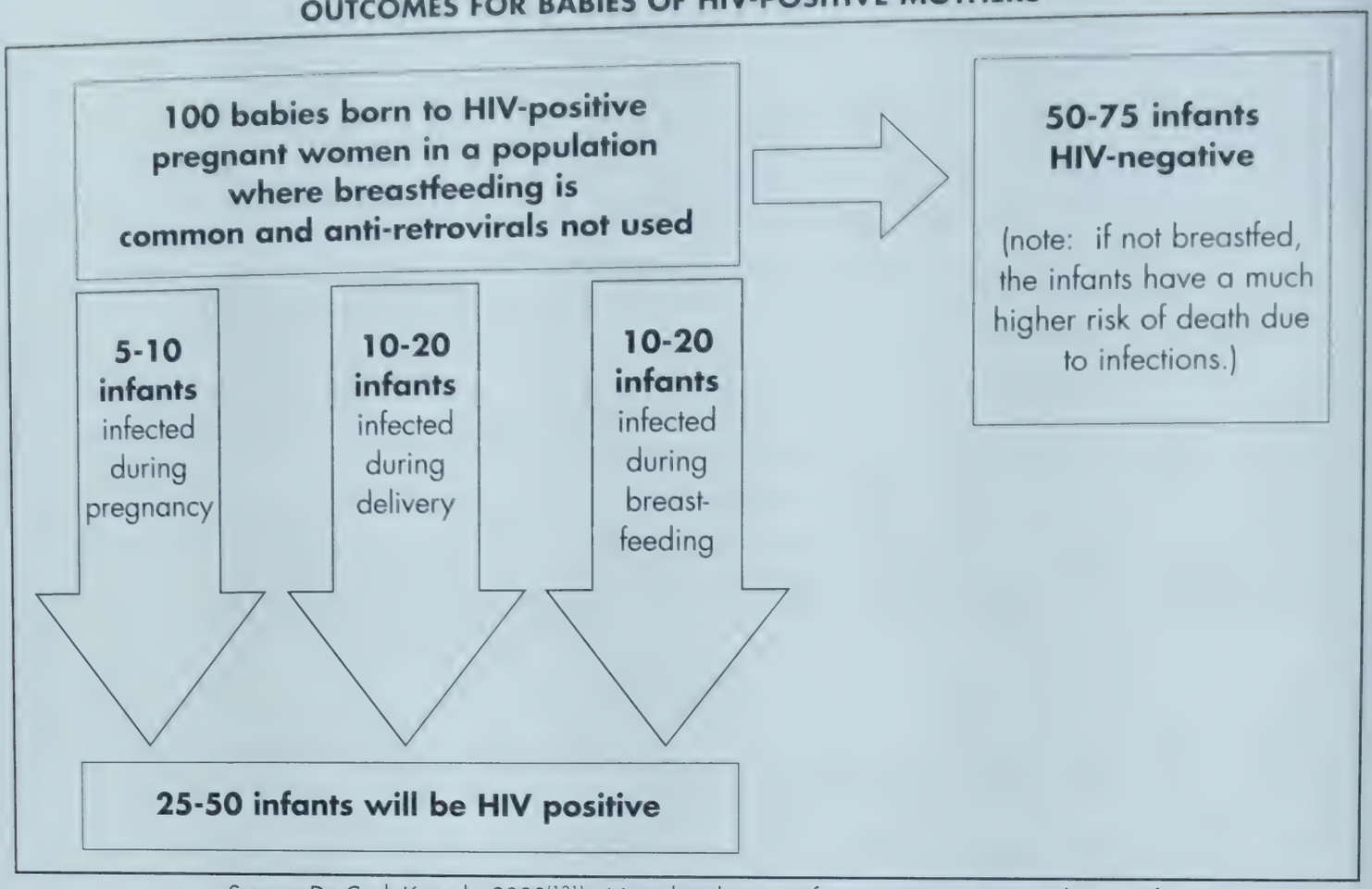
- ✔ STIs are often asymptomatic in women;
- ✔ women are often unaware of the significance of symptoms they experience;
- ✔ coverage of STI services is often poor;
- ✔ use of maternal health services is often limited by social taboos;
- ✔ investigations to reliably diagnose STIs are often unavailable;
- ✔ quality of services for STI treatment is often low because of unclear guidelines for treatment;
- ✔ treatment supplies may be unavailable; and
- ✔ partner tracing is difficult, thus making reinfection likely.

Although treatment of STIs is important and the quality of services needs to improve, prevention is the key, especially among adolescents. Prevention is particularly important for HIV because a cure is not currently available, and the impact on mother, infant, and society is catastrophic. A woman who is HIV-positive has a higher chance of having a spontaneous abortion or fetal death[131]. Worldwide, about 60,000 infants are infected with HIV each year as a result of mother-to-child transmission[131]. For every 100 pregnant women who are HIV-positive, (in a setting without antiretroviral drugs and breastfeeding is common) between 25 and 50 of their babies will be infected with HIV. The virus may be passed from mother to baby, and this is commonly termed mother-to-child transmission (MTCT/HIV). There are three major methods of MTCT/HIV:

- ✣ during pregnancy, the virus can pass across the placenta;
- ✣ during delivery, the newborn can be infected as the vaginal secretions touch the baby;
- ✣ after delivery, the newborn can be infected through breastfeeding.

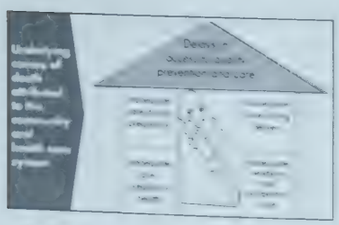
Figure 1.10 illustrates the outcomes for babies of HIV-positive mothers in a population where breastfeeding is common and anti-retrovirals are not used.

FIGURE 1.10
OUTCOMES FOR BABIES OF HIV-POSITIVE MOTHERS



Source: De Cock K et al, 2000[131]; Note that the rate of transmission varies with many factors including stage of HIV infection, strain of HIV, and possibly the mother's nutritional status.

Although new interventions, such as short-course antiretroviral regimens, may reduce MTCT/HIV, the translation of such policies into action is extremely complex, especially those regarding breastfeeding by HIV-infected women in low-resource settings[132,133]. Prevention of HIV infection in women of reproductive age, especially among adolescent girls, is crucial for success against AIDS, as experience in Uganda has shown[131]. Interventions to address MTCT/HIV are discussed in Part Four with examples of lessons learned.



2. Inadequate care during pregnancy

The care of a pregnant woman in her home, in the community, and in the formal health care system is an important determinant of maternal and newborn deaths[134]. In the home, key issues include nutrition, the workload for the pregnant woman, and planning for the pregnancy. In many settings, the mother is expected to continue her heavy workload even until full term[129]. Excess workload, specifically, more than five hours of standing per day, is an independent risk factor for preterm labor and is also a factor in IUGR. Nutrition in pregnancy affects outcomes for the baby. Although research trials of improved nutrition in pregnancy have shown a significant reduction in LBW rates and fetal-neonatal mortality, reviews of programs addressing nutrition in pregnancy have not found such dramatic effects[24,127].

Inadequate quality of caren during pregnancy: The contribution of care during pregnancy to the improvement of outcomes is unclear, possibly because the highly variable quality of care makes comparisons difficult. When the quality of care is poor, even numerous visits will not improve outcomes for the mother or the baby. However, even a few antenatal visits at which standard protocols of care are followed may have a significant impact on outcomes. A recent WHO randomized control study on antenatal care modes with four visit of specified care was not detrimental to the outcome. Some reviews suggest that antenatal care is more effective in improving fetal-neonatal outcomes than maternal outcomes[135]. Specific interventions shown to be effective in improving maternal or fetal-neonatal outcomes include tetanus toxoid, identification and treatment of STIs, presumptive treatment of malaria[69,126] and hookworm in endemic areas, and identification and management of high blood pressure and malpresentation[136, 139]. These and other evidence-based interventions are discussed in more detail in Part Four.

Undernutrition during pregnancy: Maternal nutrition interventions during pregnancy can improve neonatal birth weight and reduce perinatal mortality by up to 50 percent[127]. Between 24 and 67 percent of pregnant women worldwide are anemic, and this is a risk factor for IUGR and preterm birth, in addition to adverse outcomes for the mother. Iron supplementation has been shown to increase maternal iron levels, yet many pregnant women do not receive or take iron during pregnancy. Nutrition throughout the life cycle for the female child is crucial because the pre-pregnancy weight of the mother has the strongest correlation with maternal and newborn health outcomes[24].

Infections during pregnancy: Maternal infections have a major impact on both maternal and fetal-neonatal outcomes. There are four major categories of adverse fetal-neonatal outcomes due to maternal infection in pregnancy presented below.

- *Birth defects* are classically caused by infection in early pregnancy, such as maternal rubella infection resulting in congenital rubella syndrome with the typical triad of congenital heart disease, cataracts, and deafness[138].

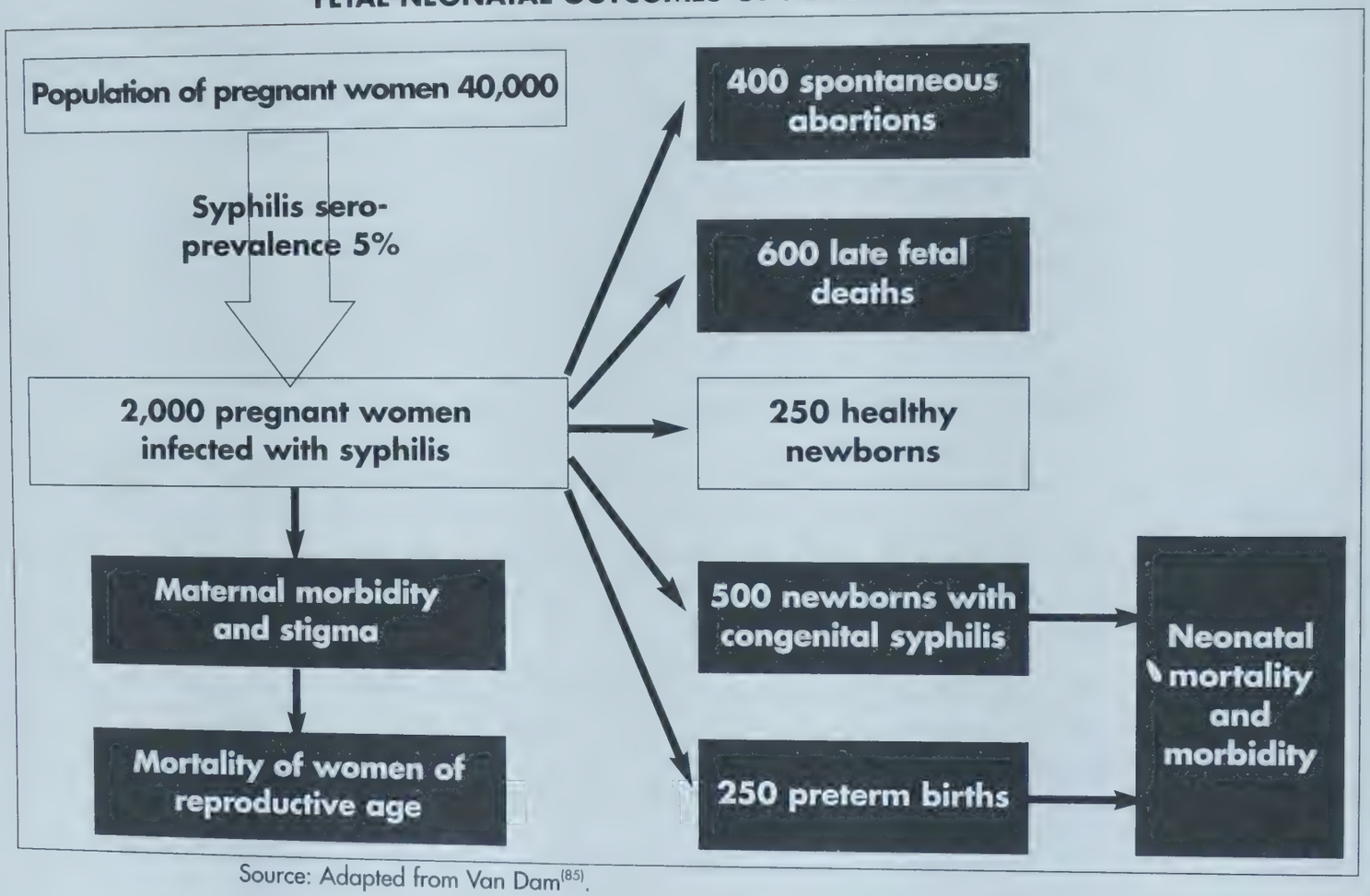
- *Spontaneous abortion or fetal death* is often of unknown cause. There is a paucity of information on causation for the estimated 4 million stillbirths a year. The available information suggests that maternal syphilis infection is a leading cause of spontaneous abortion and fetal death[82] (Figure 1.11).

- *Neonatal infection* is the cause of an estimated 1-2 million neonatal deaths[91]. Some neonatal infections, especially early-onset infections that have the highest case-fatality rate, are directly related to maternal infections, such as gonorrhea and group B streptococcus.

- *Low birth weight* may be related to maternal infection. Maternal infections, such as malaria, may indirectly increase the risk of fetal-neonatal death due to IUGR, preterm birth, or both[69].

Every year an estimated 333 million new cases of STIs occur worldwide[57]. A few of the significant infections and their results are summarized in Table 1.7. The effects of maternal syphilis are particularly harsh for newborns, resulting in large numbers of stillbirths and preterm births[68,82]. In a population where five percent or more of adult women have syphilis (this may be true for much of sub-Saharan Africa), it is likely to be the major cause of late fetal deaths and also a major factor in neonatal mortality and illness (Figure 1.11). Yet treatment has been available for over half a century. The problem is not with new interventions but with policy and management for implementation. HIV infection also has a devastating effect on both maternal and fetal-infant outcomes, although most infant deaths due to HIV probably occur after the first month of life. HIV is discussed in Part Four under the Pre-Pregnancy Health Intervention Package as well as MTCT/HIV in the Essential Newborn Care Intervention Sub-Package.

FIGURE 1.11
FETAL-NEONATAL OUTCOMES OF MATERNAL SYPHILIS

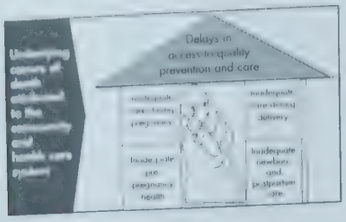


Source: Adapted from Van Dam[85].

TABLE 1.7
INFECTIONS IN PREGNANCY RELATED TO MATERNAL AND FETAL-NEONATAL OUTCOMES

Maternal infection	Prevalence of infection in pregnant women (1990-1999)	Maternal outcomes	Vertical transmission rate	Fetal manifestations	Neonatal manifestations
Syphilis (Treponema pallidum)	Industrialized: 0.03–3%. SSA / SA: 3–22%.	Complications of primary, secondary and tertiary syphilis. Infertility.	Early: ~ 100%. Late: ~ 23%. Overall: 40 – 70%.	Spontaneous abortion rate: 20%. Late fetal death rate: 12%.	Preterm birth: 12.5%. Congenital syphilis: 12.5%.
Gonorrhea (GN) (Neisseria gonorrhoeae)	Industrialized: <1%. SSA / SA: 4–20%.	Puerperal sepsis. Infertility.	Isolated gonorrhea: ~ 47%. Gonorrhea and chlamydia. infection: ~ 68%.	"Septic abortion" rare event?	LBW (preterm birth or IUGR): 11 – 25%. Ophthalmitis, risk of blindness.
Chlamydia (CT) (Chlamydia trachomatis)	Range 2–37%. Global data poor quality.	Puerperal sepsis. Infertility.	Conjunctivitis: 60–70%. Pneumonia: 5– 15%.	Fetal loss believed to be rare.	Severe conjunctivitis: 25%. Severe pneumonia: 5%.
Bacterial vaginosis (Mycoplasma hominis, Ureaplasma urealyticum)	USA: 10-19%. Global data unavailable.	No major effects documented.	Not applicable.	No major effects documented.	Preterm birth: 10 – 25%.
Group B streptococcus carriage (Group B streptococcus)	Industrialized: 15–45%. Latin Am: ?. Turkey: <10%. SSA / SA: low.	No major effects documented.	Not applicable.	No major effects documented.	Neonatal sepsis and meningitis with high fatality rate especially if early onset.
Rubella (Rubella virus)	Indust: high vaccination coverage. Latin Am: sero-susceptibilty 3-40%. SA /SSA: sero-susceptibility 5-30%.	Usually minor illness. Maybe significant arthralgia.	Infection in first trimester results in about 90% of fetuses seriously affected.	Early pregnancy loss. Increased late fetal deaths.	Congenital rubella syndrome, 50% with deafness alone, 10 -15% with severe disability(cardiac, cataract, failure to thrive).
HIV (Human Immunodeficiency Virus)	Industrialized: <1%. Latin Am:<5%. SA: 5–10%. SSA: 5-40%.	AIDS/death. Reduced fertility. Social stigma.	15-30% in-utero or at birth. 10-20% via breastfeeding. Varies with maternal HIV viral load and other factors.	Increased pregnancy losses.	Preterm birth. IUGR. AIDS/death.
Genital herpes simplex virus (Herpes simplex virus)	USA: 20–30% old infection 0.01–.039% active at delivery. Europe: <5%.	Cervical cancer.	Primary infection: 30 – 50%.	No major effects documented.	80 % chance of Herpes encephalitis if active maternal infection and vaginal delivery.
Malaria (Plasmodium falciparum)	Endemic in many parts of sub-Saharan Africa.	Anemia. Risk of severe malaria especially in primiparas.	Congenital malaria is believed to be rare.	IUGR. Some preterm birth, especially in areas of unstable transmission.	Complications of IUGR and preterm birth.

Source: Van Dyke 1995[82], Schulman 1999[126], Cuhs 1999[107], DeCock 2000[131].

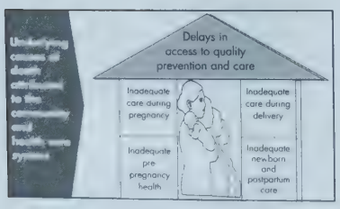


3. Inadequate care during delivery

Many women and newborns have a normal delivery, and for these women, the experience should be clean, safe, and joyful. For the 15 percent of women who do develop complications, rapid identification of danger signs and their appropriate management is crucial both for the mother and for their babies.

Delivery without a skilled birth attendant: The presence of a skilled attendant at birth is associated with reduced maternal and perinatal mortality[2,13]. Yet only about half of the world's deliveries currently occur with a skilled attendant. WHO's "Making Pregnancy Safer Initiative" is an important effort to increase coverage with skilled attendants, but success will depend on national, regional, and local managers. Current practices of even well-trained providers often differ widely, and there is a need to monitor and improve quality of care, even among those who are considered to be skilled.

Inadequate access to emergency obstetric care: Access to quality, emergency obstetric care is crucial, especially to reduce maternal mortality[35,139]. Many of the causes of maternal death and stillbirth/early neonatal deaths cannot be handled by an isolated attendant, regardless of skill level. Emergency care is important for the mother and the newborn, especially to prevent asphyxia. It has been estimated that about 15 percent of women experience a life-threatening condition during delivery. Yet many pregnant women do not live within safe distance of a functioning emergency obstetric service, and even fewer live near a facility that provides quality service. "Medicalization" and unnecessary or even harmful interventions should not be confused with the need for emergency care. Unnecessary cesarean-sections are common in some Latin American settings, are harmful for both mother and baby, and have been documented to raise the perinatal mortality rate[140].



4. Inadequate newborn care

Care of the newborn is important, both in the home and in the formal health care system.

Lack of essential newborn care: Although many newborn complications, such as asphyxia or sepsis, have high case-fatality rates and treatment is difficult, prevention is highly feasible and cost-effective. Even basic prevention of newborn illness is often lacking. Prevention measures include the "Six-Cleans" promoted by WHO (clean hands, clean delivery surface, clean blade, clean tie for the cord, and clean cloth for mother and baby), early exclusive breastfeeding, and warmth. These simple interventions could prevent many neonatal deaths, and yet they are inadequate in many settings, even those with health institutions[87]. The benefits of breastfeeding after delivery cannot be stressed enough (Table 1.8).

TABLE 1.8
BREASTFEEDING ADVANTAGES

FOR THE BABY

- ✔ Protects the baby from infections, especially diarrhea and respiratory tract and ear infections.
- ✔ Provides all the required nutrition for optimal growth for the first 6 months.
- ✔ Provides an important source of nutrition from 6 months to 2 years.
- ✔ Colostrum provides valuable antibodies and is high in protein, Vitamins A and K, and zinc.
- ✔ Reduces the risks of later allergies and diabetes.
- ✔ Promotes proper jaw, teeth, and speech development.

FOR THE MOTHER

- ✔ Decreases the risk of postpartum hemorrhage.
- ✔ Provides a natural way to help space pregnancies and thereby protect both mothers and children.
- ✔ Delays the return of menses, helping to protect the mother against anemia by conserving iron.
- ✔ Fosters mother-infant bonding.
- ✔ Decreases the risk of breast and ovarian cancers and osteoporosis.

FOR THE FAMILY

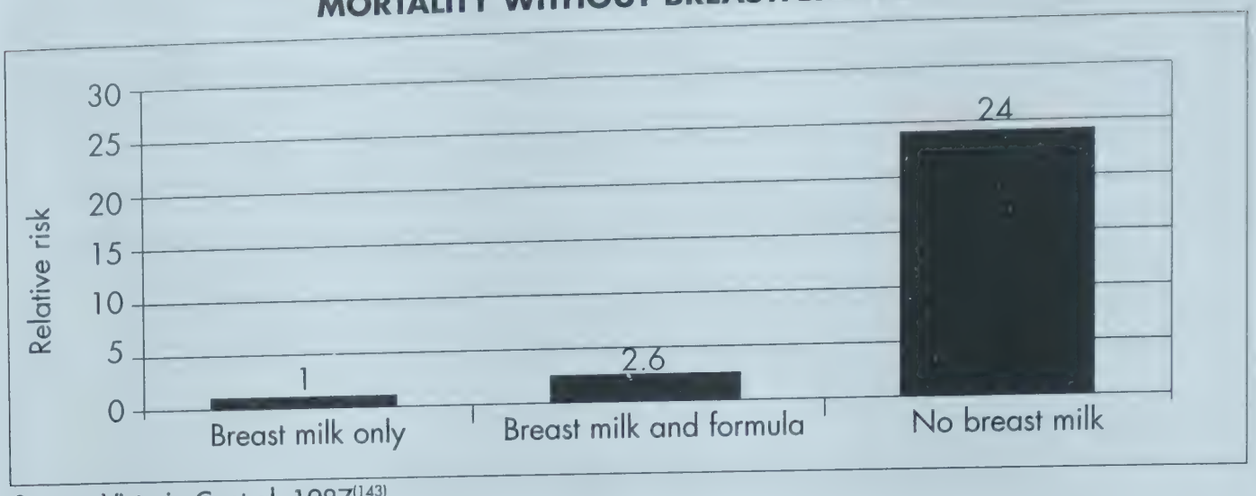
- ✔ Costs no money.
- ✔ Saves medical costs by preventing illnesses and allergies.
- ✔ No preparation necessary.

FOR SOCIETY

- ✔ Decreases the pollution of air, water, and land from the production, transportation, and preparation of artificial baby milks and disposal of containers and packaging.
- ✔ Avoids importation of artificial milk which may increase the trade deficit.
- ✔ Limits population growth by a natural and effective method of family planning.

Breast milk provides balanced nutrition, giving the best weight gain for the infant's first 6 months[141,142]. It is also effective in protecting the infant from infection. In fact, a baby in a setting with many infections who is not breastfed is at least 24 times more likely to die than an exclusively breastfed baby in a similar setting[143].

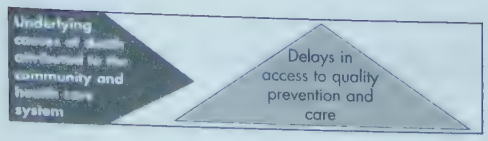
TABLE 1.9
INCREASING RELATIVE RISK OF NEONATAL MORTALITY WITHOUT BREASTFEEDING



Source: Victoria C, et al. 1987[143].

Lack of extra newborn care for the LBW baby: Even simple interventions for LBW babies, such as maintaining warmth and skilled support for breastfeeding, are often not routinely practiced. Recognition of the LBW baby or of danger signs in the newborn has not been widely incorporated into community-based programs in areas where most of these babies are born and often die[144].

Lack of emergency newborn care: Lack of quality, emergency newborn care is a factor in the higher case-fatality rates seen in many low-resource settings. Case-fatality rates for neonatal sepsis vary around the world[52]. WHO is producing documents promoting standards of care for the mother and the newborn (more details in Part Four), but these have not yet been widely implemented. There is a lack of skilled personnel, trainers, and training materials in many of the settings with high neonatal mortality.



D. Delays in Access that Contribute to Fetal-Neonatal Deaths

Women and their families in developing countries face many barriers to receiving quality maternal and newborn care. The expectation of survival for a sick newborn, especially a LBW baby, is often so low that even well-educated families may not seek care. Baby girls may be less likely than boys to receive timely and appropriate care. Delays in obtaining care occur at four critical points:

- ***Delay #1: Delays in problem recognition within the home.***
- ***Delay #2: Delays in deciding to seek care.***
- ***Delay #3: Delays in reaching the health facility due to lack of transport and resources.***
- ***Delay #4: Delays in receiving appropriate quality care at the facility.***

Delay #1: Delays in problem recognition within the home: A sick newborn's condition can deteriorate very quickly, often in a few hours. The signs and symptoms are often subtle, and family members or health workers often do not recognize or cannot identify danger signs. Many newborn deaths occur in the first 24 hours after birth, and a lack of skilled attendance reduces the chances of rapid identification and management of life-threatening situations.

Delay #2: Delays in deciding to seek care: Even if danger signs are identified, the family might not seek care in a timely manner for many reasons, including:

- lack of understanding of the urgency attached to newborn illnesses or obstetric emergencies;
- traditions regarding seclusion of mother and newborn or "non-personhood" of the newborn;
- fatalistic outlook, belief in evil spirits;
- lack of family finances to pay for care and transport;
- traditional leaders may have to be consulted;
- distrust of the formal health care system, including fears of procedures;
- lack of clarity about where to go in the health system (health center versus hospital, etc.);
- previous poor experiences with the health system (rudeness, delays, shame, language barrier, etc.); and
- gender selection, with a female child being less likely to receive appropriate attention[42].

Beliefs may dictate that traditional remedies (i.e., herbs, traditional medicines) must be tried before treatment is sought from the formal health sector. Although many traditional medicines may be somewhat beneficial or benign, some are harmful. The main concern is that access to appropriate quality health services is significantly delayed, possibly ending in death. For example, a baby with neonatal tetanus has only a ten percent chance of surviving, and delay in seeking appropriate care may rapidly eliminate any chance of survival.

PANEL 1.2
LESSONS LEARNED

DELAY IN DECISION-MAKING

In Cambodia, Chan brought her baby to the health center on the baby's fifth day of life. Sopha was Chan's 14th child (they were all born alive but six had died). On the second day, the baby had redness around the cord. Chan was not able to seek health care because women and newborns are not allowed to leave the home until the "dropping the stone ceremony" is compieted three days after birth. This ceremony symbolizes that the mother and the newborn have survived the birthing process. By the time Sopha reached the health center, she had a very high fever and was not feeding. Despite having antibiotic injections, she died the next day.

In many traditional societies, men make the key family decisions. If the mother or the newborn needs to seek care, critical time can be lost in waiting until the husband or another male family member is present. A study of 150 maternal deaths in Pakistan identified the refusal of the husband or his absence as a major factor in 29 percent of deaths[75]. After many discussions in a CARE project in Somalia, the village elders decided that if a woman or sick child needed to go out of the village when the male relatives were away, the village chief could make the decision to send the woman or child to a health facility or could assign an elder to accompany her.

Delay #3: Delays in reaching the health care facility due to lack of transport and resources: Lack of adequate or affordable transportation is a common problem and affects outcomes for the baby in two ways. First, the pregnant woman may be delayed in accessing quality emergency services, possibly resulting in asphyxia or even death for the baby, as well as the risk of death for the mother. Second, it may delay prompt health care for a sick newborn, significantly decreasing potential for survival. Lack of transport and no money were cited as the major reasons for maternal deaths in a study in rural Zimbabwe. A maternity waiting home was effective in addressing this delay in Zimbabwe[145].

PANEL 1.3
LESSONS LEARNED

A BEAUTIFUL DAUGHTER

One of the village leaders had a beautiful daughter and was waiting for his first grandchild. When his daughter went into labor, she had pains for almost a day, but the family was not worried because they thought this was normal. By the next day, her pains were getting worse and she looked weak, so the family called the village doctor. He could not relieve the pain. Finally, the father decided to take his daughter to the hospital.

It took several hours to find a rickshaw driver, and the journey to the hospital was long. When they got to the hospital, it was some time before the daughter was seen. The doctor found that the baby had already died and the woman's uterus had ruptured. She had to have a hysterectomy. Now the girl, not yet 20 years old, was infertile. Her husband has since taken another wife.

The village leader was determined that such a tragedy should not happen to someone else's daughter. This man, with assistance from CARE, has spearheaded a community transportation fund. The fund is supported by donations from all of the village leaders. They have also established a standing committee to escort women to the hospital. The girl's father now says that had he known more when his daughter was in labor, he would have taken her to the hospital earlier.

Delay #4: Delays in receiving appropriate quality care at the facility:
Many causes of fetal and newborn death are related directly to the use of inadequate maternal health services. There are often delays in the mother or newborn receiving care even after they reach the facility for reasons, such as:

- inadequate staffing, equipment, and supplies;
- facilities that operate only for a few hours a day, a few days a week;
- no system for rapid assessment of the mother or baby;
- lack of standard protocols to promote quality of care;
- unskilled providers and inadequate supervision;
- poor interpersonal skills of staff;
- lack of transportation or referral between health facilities; and
- poor record-keeping or no referral letter.

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Neonatal illnesses are subtle in presentation and may be missed or incorrectly diagnosed even by skilled medical personnel. Many of the interventions that affect mortality, even at the tertiary care level, are simple and inexpensive, such as:

- simple equipment and skills for neonatal resuscitation;
- support for early initiation of breastfeeding;
- "kangaroo care" for temperature control of small babies; and
- treatment of jaundice using light bulbs.

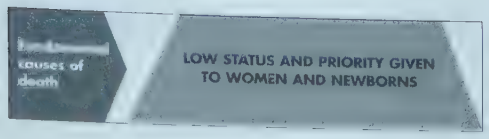
Even among preterm babies, deaths potentially could be significantly reduced with attention to these interventions. These and other interventions are discussed in Part Four with more details on the CD-ROM.

TABLE 1.10
UNDERSTANDING REASONS FOR DELAYS IN ACCESS AROUND THE WORLD

- In Nepal, mothers-in-law attend most deliveries, and additional care or help is sought only if the mother-in-law decides that such care is needed.
- In Ghana, a study found that 64 percent of women who died of pregnancy-related complications had sought help from an herbalist, soothsayer, or other traditional provider before going to a health care facility.
- In Benin, the government put significant pressure on women, including fines, to have institutional deliveries. Many women continued to choose to deliver at home because of the honor brought to families if they were seen as stoic during labor and childbirth.
- In Tanzania, a study found that 21 percent of women delivered at home because of the rudeness of health staff – even though they thought delivering in a health care facility was safer.
- In Ecuador, women perceive hospital-based deliveries as entailing a violation of privacy, unacceptable attendance by male providers, and unfamiliar birth positions.
- In Sudan, a study found that many women were ashamed of being poorly dressed in front of health care workers (who were generally of a higher socioeconomic class) and were afraid that the health care workers would react negatively to their illiteracy.

Source: "Improve Access to Maternal Health Services," published by Family Care International and the Safe Motherhood Inter-Agency Group in 1998.

Programs that promote planning for the possibility of maternal emergencies may dramatically increase access to emergency services. However, very few birth planning or emergency preparedness programs include the newborn.



E. Fundamental Causes of Fetal-Neonatal Deaths

1. Newborn outcome as a marker for women's health and social status

The perinatal mortality rate is a good marker of maternal health and quality of maternal services. This rate is strongly influenced by women's social and health status and by home care and practices for mother and newborn, as well as by maternal and newborn health care services[146].

The LBW rate could be considered a "social indicator," reflecting the status of women of reproductive age in a society. Women who give birth to LBW babies have often been undernourished themselves since childhood[24]. In fact, it has been found that women who themselves were LBW are more likely to have LBW babies, even when other determinants of LBW are controlled for[118,119]. In addition, these women often have many children spaced close together, maintain their full workload during pregnancy, and may restrict their diet due to fear of delivering a big baby. India and Bangladesh have the world's highest LBW rates, at 33 and 30 percent, respectively. These rates may reflect the intergenerational effect of undernutrition of female children (Figure 1.9).

2. Traditional care practices in the home and the community

Many factors affect girls and women before they become pregnant, including sociocultural conditions and traditional beliefs and practices. In many cultures, women are valued less than men. This attitude may manifest through sex-selective abortions, female infanticide, limited access to food, lack of educational opportunities, restricted mobility, lack of participation in decision-making, early marriage, expectation to bear many children, female genital cutting, heavy workloads, physical and emotional abuse, and inadequate access to health services. As a result, women in the developing world often begin their pregnancies at a disadvantage regarding nutrition, workload, and access to health services.

Undernutrition of girls and women throughout life: Girls often have less access to food than boys. Research in Bangladesh found that five-year-old boys were given 16 percent more food than girls of the same age[42]. A study in India found that boys were more likely than girls to be given fatty foods and dairy products. As a result, girls were four times more likely than boys to suffer from malnutrition. The study also found that girls were 40 times less likely than boys to be taken to the hospital. These practices are common in South Asia and, to a lesser extent, in parts of Africa. A high LBW rate may reflect intergenerational neglect of nutrition of females in that society.

Early marriage: In many countries, girls are often married shortly after or even before menarche to ensure that babies are not born out of wedlock, bringing shame to their families. "Society will condemn us if our daughters are not married by the age of 15," say women in an Indian village[147]. Early marriage limits educational and economic opportunities for girls and often leads to early pregnancy.

High fertility rates: In many societies, young women are trapped by traditions that strongly promote early and frequent childbearing to gain respect within the society. Although fertility rates have dropped, there are still 35 countries with total fertility rates greater than five[1]. Sub-Saharan Africa has the highest lifetime risk of maternal death because it has the highest fertility rate. The combination of poor nutritional status and heavy workloads also increases the risk of LBW. These factors all contribute to an increased risk of perinatal and neonatal mortality. Studies have shown that there is a rise in mortality when children are spaced closer than 18 months. There is also an increased rate of LBW babies with close birth intervals[130].

Lack of educational opportunities: Female literacy is a useful indicator of women's status and also a strong predictor of child survival and early childhood development. There is a well-documented link between women's literacy and lower rates of infant mortality. Higher levels of female education are also associated with lower rates of maternal morbidity and mortality. Of the 130 million children who are not attending primary school in the developing world, 60 percent are girls. Although more girls are entering primary school than before, the dropout rates for girls remain high in many countries[148]. Of the estimated 960 million people who are illiterate, two-thirds (66%) are women. This lack of education significantly restricts their earning potential and involvement in decision-making about family resources and health care.

Care practices for the mother and newborn: In every society, pregnancy, childbirth, and newborn care are strongly associated with traditional practices, which can be classified as beneficial, harmful, or benign. Beneficial practices may include special nutritious foods for the mother, massaging the mother and newborn, and support with breastfeeding. Examples of harmful practices include putting cow dung, ash, and herb mixtures on the umbilical cord, withholding colostrum, pre-lacteal feeding, and giving hot water and pepper enemas to neonates who do not pass stool daily. Harmful practices for the mother, such as female genital cutting, also have effects on the baby, increasing the risk of obstructed labor. Assessment of such practices as beneficial, harmless, or harmful is discussed in Step 2 of Part Three.

V. WHAT CAN BE DONE TO IMPROVE NEWBORN HEALTH?

There is a huge gap in newborn health outcomes between the industrialized world and developing countries. Many industrialized nations have a perinatal mortality rate of less than 5 per 1000 total births, yet some sub-Saharan African countries have rates of over 100 per 1,000 total births, a 20-fold difference. These deaths are not due to obscure diseases seen only in the tropics, but to causes that we know how to prevent and treat, such as neonatal tetanus, asphyxia, and syphilis. Even within many industrialized nations, there are sub-populations with perinatal mortality rates substantially higher than the national average.

These gaps are not due to a lack of interventions, but to a lack of implementation, particularly a lack of implementation where the majority of these deaths occur. The major issue is not our knowledge, but our action. Little attention has been given to the newborn, especially at the community level where most of the deaths occur. The solution must involve adequate attention to both the mother and the newborn. Thus, health services that benefit the newborn and the mother should be given priority.

The huge "Opportunity Gap" in global newborn health is not due to a lack of possible interventions, but to a lack of effective implementation of interventions where most babies are dying.

Moving towards a new paradigm in global newborn health – Unfortunately there is no "magic" single solution. To address newborn (and also maternal) deaths, we need a shift in paradigms (Figure 1.12).

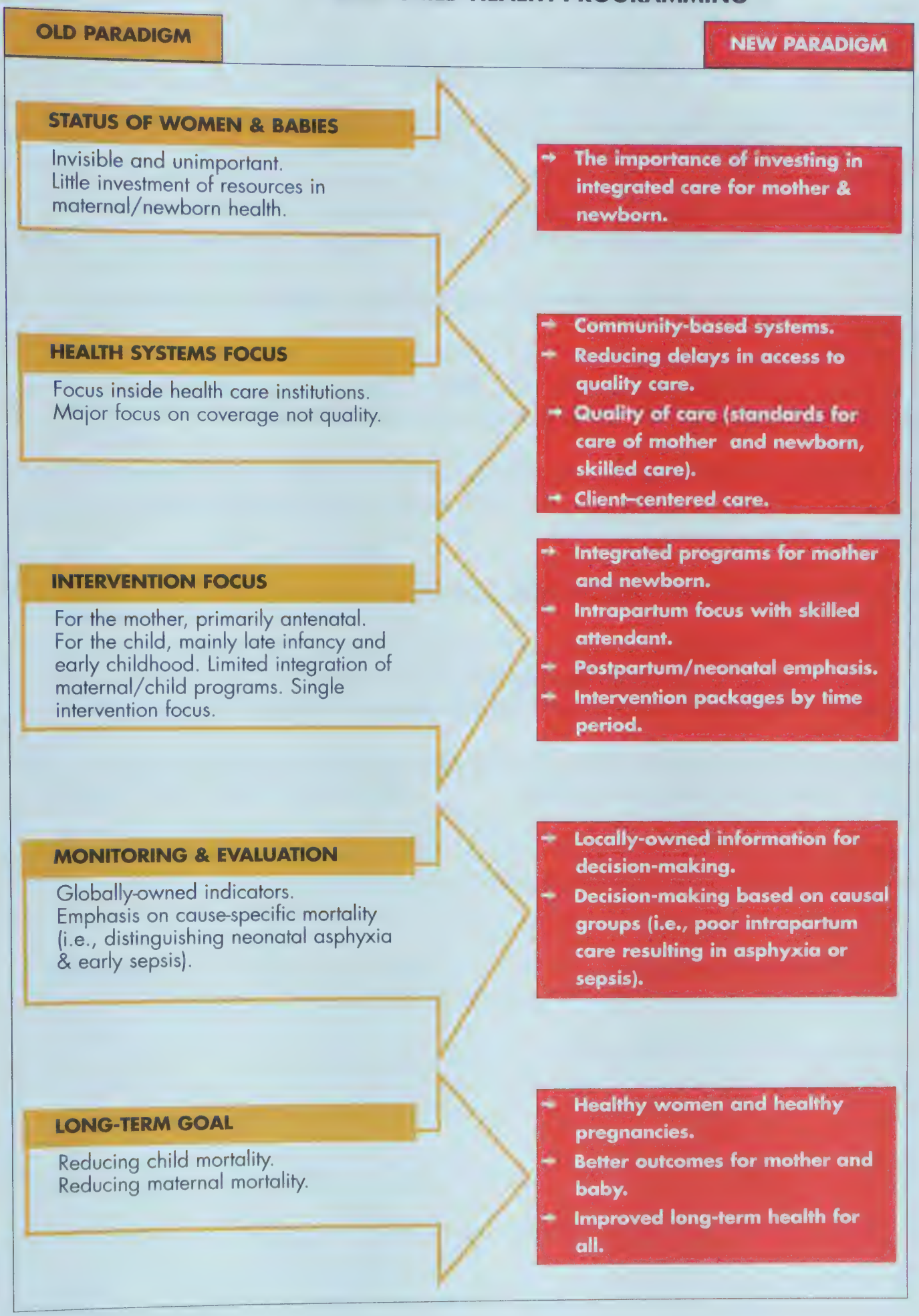
- The time focus of care for the mother and newborn needs to emphasize the time when most deaths occur, in the first week after delivery, especially the first 24 hours.
- The place focus needs to shift to where most deaths occur – in the home.
- The drive to increase coverage of care needs to shift from blaming mothers for coming late for treatment to reducing critical delays in recognition of danger signs, decision-making, and transportation and to improving the quality of the health care system.
- The efforts to improve quality of care in the health institution need to focus on building the capacity of the system, as well as improving the quality of the client-provider interaction.
- The focus of record keeping needs to shift from globally-owned indicators to locally owned information for decision-making.
- Our long-term goal needs to include the improvement of health, as well as the reduction of mortality.

"Rights-based" paradigm: Successful application of the health systems programming model as detailed in this manual is based on the principle that women and their newborns have a fundamental *right* to access quality health services[149-151]. This is detailed further in the Introduction.

Moving towards a community-based systematic approach for newborn health: It is impossible to ensure healthy births and newborn health with a single intervention. For effective programming, a systems approach is critical. If there was a single, simple solution for newborn health, the statistics would be very different from the ones we have[152]. In settings where resources are apparently dwarfed by huge problems, it is especially crucial to use data to identify the "Opportunity Gap" – the gap in health care outcomes that is not necessarily the biggest cause of mortality, but the most appropriate and cost-effective for intervention. A community-based systems approach that is focused on the mother-baby dyad and uses local information to make decisions systematically can help to close this gap. Adaptable approaches to implement this will be covered in Parts Two and Three of this manual.

Moving towards partnerships for priorities for newborn health policy: Since most deaths of babies and mothers occur in the community, this is where the priority should be focused. However, implementation of interventions at the community-level will be more effective if there are clear global priorities and partnerships to share resources and information. International collaboration can be effective in developing successful approaches for key problems of newborn health and health care and finding ways to apply old solutions or develop new ones. Global policy agreement also increases the chances of successful advocacy for resources to promote newborn health. An interagency group on the newborn (Healthy Newborn Partnership) is currently being developed. The secretariat is based at the Saving Newborn Lives Program of Save the Children in Washington, D.C. The World Health Organization and JHPIEGO are producing global standards of care during pregnancy and the postpartum/newborn period. The first book, *Management of Complications of Pregnancy and Childbirth,* has also been endorsed by the World Bank, UNICEF and UNFPA (included on the CD-ROM). This is a critical step forward in improving quality of care, but it will not change outcomes for women and babies unless these guidelines are adapted at the national level and implemented at the local level. Implementation at the local level depends on the program manager. You, the program manager, can make a significant difference to improve newborn health in your community.

FIGURE 1.12
MOVING TOWARDS A NEW PARADIGM FOR MATERNAL AND CHILD HEALTH PROGRAMMING



BEST READING

FOR PART ONE

AN UNHEARD CRY FOR NEWBORN HEALTH

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Part

2

A Newborn Health Management Information System

PART TWO

A Newborn Health Management Information System

PAGE

Messages for Part Two 2.2

Terminology for Part One 2.3

I. Principles for Use of Information in Newborn Programming 2.4

II. Basic Epidemiological Skills for Newborn Health Programming 2.7

A. The Count-Divide-Compare (C-D-C Cycle) 2.7
B. Divide 2.9
C. Compare 2.14
D. The Opportunity Gap Described by Time, Person and Place 2.22

III. Building a Health Management Information System for Newborn Health 2.25

A. Translating Data into Information 2.25
B. Designing a Basic Health Management Information System (HMIS) 2.28

Summary – Building an HMIS 2.38

IV. The Birth Weight and Age-at-Death Boxes for an Intervention and Evaluation System Matrix 2.39

A. The Uses of the BABIES Maxtrix 2.39
B. Basic Concepts for Understanding BABIES 2.40
C. Using BABIES to Program for Newborn Health 2.52

Summary of BABIES 2.65

V. Quality Management in Newborn Health Programming 2.66

A. The Principles of Quality Management 2.66
B. The Quality Triangle 2.67
C. Foundational Principles for Total Quality Management 2.69
D. Quality Improvement Story 2.71
E. Quality Tools 2.78
F. Capacity-building 2.84

Summary of Quality Management 2.85

Best Reading for Part Two 2.86

References for Part Two 2.87



MESSAGES FOR PART TWO

1. Understand the importance of information in decision-making for newborn health programming and the difference between data and information.

2. Learn some of the basic principles of epidemiology needed for newborn health programming, especially the count-divide-compare cycle.

3. Understand the three basic steps in building an HMIS for newborn health and how to apply them.

Response:	What decisions do I need to make?
Analysis:	What questions do I need to answer to make the decisions?
Collection:	What data do I need to collect in order to answer these questions?

4. Learn about the BABIES management tool for newborn health, its advantages, how to build and adapt the matrix, and how to use it to aid in decision-making in the four steps of the step-by-step approach for newborn programming.

5. Appreciate the importance of quality in program management and learn about some tools and approaches to improve quality as a team.



TERMINOLOGY FOR PART TWO

Action plan: A plan for the implementation of the countermeasure(s) showing who takes what actions, when they take them, where they take them, and how they are taken.

BABIES (Birth Weight and Age-at-death Boxes for an Intervention and Evaluation System): An adaptable assessment tool that allows the program manager to collect, organize, analyze, and translate data into information for newborn health intervention. It uses two pieces of data: age at the time of death of the fetus/ newborn and birth weight group.

C-D-C (count-divide-compare): A cycle of activities in applied epidemiology that starts by counting events and then uses division to form ratios, proportions, and rates in order to compare populations in time, place, and person. The purpose is to promote action to solve a health problem.

Consensus: An agreement to support a decision arrived at by the team; it implies willingness to standby the action taken by the team.

Countermeasure: A proposed solution to a problem.

Countermeasure matrix: A matrix of factors to help team members show the relationship among the problem statement, root causes, countermeasures, and practical methods to overcome the problem.

Fishbone: A graphic composed of lines and words to represent a meaningful relationship between an effect and its causes and to identify a cause upon which the team can take action.

HCDS (health care delivery system): Includes all people who provide and receive services (i.e., communities, local providers, health institutions, and the intersectoral system)

HMIS (health management information system): An adaptable system that collects, analyzes and responds to data about the occurrence and distribution of health outcomes for a population within a given geographical location, and links these outcomes with other relevant data that are translated into information to manage the activities to improve health outcomes.

Management: A process by which one plans, implements, and evaluates an organized response to a health problem.

Process: A repetitive and systematic series of actions or operations where resources are used to develop or deliver products or services.

Quality management: A process to ensure patient or client satisfaction through involvement of all employees in reliably producing and delivering quality products or services.

Quality tools: A method or technique used in the quality management process to assist a team to solve a problem.

Team: A high-performance task group whose members are interdependent and share common performance objectives and whose purpose is to improve the quality of products and services.

I. PRINCIPLES FOR USE OF INFORMATION IN NEWBORN PROGRAMMING

PROGRAMMING PRINCIPLES FOR NEWBORN HEALTH

- **PRINCIPLE 1**
  Rights of the mother and baby to be counted and to have a record.
- **PRINCIPLE 2**
  A systems approach involving all components of the health care delivery system (HCDS).
- **PRINCIPLE 3**
  Adaptable health management information system (HMIS).
- **PRINCIPLE 4**
  A step-by-step approach: the program management cycle.

Program managers want to "do" something. They plan, implement, and evaluate organized responses to perceived problems. Each decision in the management process requires information. The programming principles for newborn health were laid out in the introduction. Principle 3 deals with the importance of information.

The overall objective of a health management information system (HMIS) is to provide information that can enable program managers to implement effective programs to improve the health of a population. An HMIS is not intended to be a stand-alone entity that makes demands on programs. It is most effective when it supports all the levels of the health care delivery system (HCDS) to translate data into information for program decision-making. This manual does not promote a separate system for the newborn. Data on fetal and neonatal health should be integrated into the existing HMIS to reduce the burden of collecting and analyzing the data. An HMIS that includes data on the newborn can be built in a simple, economical way that includes data from both the community and health facilities. This information can serve as the basis for decision-making at the community, district, and highest levels of the ministry.

Often program managers do not get the information that they want, what they want is not what they need, and what they need, they do not know how to get. Program managers often ask themselves the question, *What am I doing that I can measure?* That is the wrong question. Instead they need to ask, *What is it that I need to measure in order to know what to do?* Part Two suggest simple measurements and other data to be collected that form an essential database for the newborn program. The manual is designed to help the program manager determine what is needed in a given setting and to show the program manager how to translate data into information. Part Three will discuss how to use the information in newborn health programming.

Section II introduces some basic concepts and tools used in *epidemiology,* the study of factors that influence health in a community. The count-divide-compare (CDC) cycle is a basic approach to applied epidemiology. At the village level everyone counts. Dividing by the appropriate denominator enables the program manager to make comparisons that are needed for decision-making in designing and implementing a program.

Section III introduces a basic, simple structure of an HMIS that can be implemented in low-resource settings. This section provides the program manager with the means to strengthen the existing HMIS by incorporating data on maternal, fetal, neonatal health into a complete system. This flexible approach allows the collection of data from both the community and the health facilities to gain insight into all of the issues related to maternal, fetal and neonatal health. The system will focus on translating data into information. Program managers are **data rich, but information poor** because either they do not have the right data to make useful decisions, or the data that they do have are not being transformed into useful informa-

tion that can be used for decision-making. By using simple epidemiological and quality management principles, program managers can transform the data into information for decision-making. Senior Ministry of Health personnel can use the same data to make important decisions on policy, major resource allocation, and human resource development.

Section IV describes the BABIES matrix, a useful tool in the step-by-step approach for programming in newborn health. BABIES can be used at each level of the HCDS. It is also easily linked with other data and the managerial processes so that it can serve as the foundation of the newborn component of the HMIS.

Section V describes basic principles for quality management of services. Quality management is based on the premise that quality is *everyone's responsibility.* For this approach to be effective, dedication and commitment are needed at all levels of the organization. Some tools used in quality management are described.

Outcome rates get worse before they get better

A program manager can expect initially to have important outcome indicators worsen. Experience shows that as the HMIS improves the number of unreported and unregistered deaths will decrease. As a result of a better functioning HMIS, the reported mortality and morbidity rates will rise, due to increased reporting. This rise should be expected. Sadly, in certain situations, a rise in the infant morality rate has resulted in pay cuts or even dismissal for medical staff because of supposedly poor performance. This consequence is a strong disincentive to report maternal, fetal, and neonatal deaths. Acknowledging that the rate will increase is one way to avoid that situation. To overcome such a dilemma, international agencies should positively encourage countries to accurately define the magnitude of maternal and perinatal deaths even if the result is a significant increase in the maternal, perinatal, and infant mortality rates.

BASIC EPIDEMIOLOGICAL DEFINITIONS

Epidemiology: The study of the distribution and determinants of health-related states and events in populations, and the application of this study to control of health problems.

Denominator: The population at risk in the calculation of a rate or ratio. The lower portion of a fraction.

Incidence: The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population. More generally, the number of new events, i.e., new cases of a disease in a defined population, within a specified period. The term is sometimes used to denote incidence rate.

Incidence rate: A measure of the rate at which new events occur in the population. The number of new events, i.e., new cases of a specified disease diagnosed or reported during a defined period of time, is the numerator, and the number of persons in the stated population in which the cases occurred is the denominator.

Numerator: The absolute number of events. The upper portion of a fraction.

Population attributable risk: A measure of the amount of disease associated with an exposure within a population.

Prevalence: The number of instances of a given disease or other condition in a given population at a specified time.

Prevalence rate (ratio): The total number of all individuals who have an attribute or disease at a particular time (or during a particular period) divided by the population at risk of having the attribute or disease at that time or midway through the period.

Proportion: A type of ratio in which the numerator is included in the denominator. The important difference between a proportion and a ratio is that the numerator of a proportion is included in the population defined by the denominator, whereas this is not necessarily so for a ratio.

Rate: A ratio whose essential characteristic is that time (per minute, per hour, etc) is an element of the denominator and in which there is a distinct relationship between numerator and denominator. The numerator may be a measured quantity or a counted value.

Ratio: The value obtained by dividing one quantity by another; a general term of which rate, proportion, percentage, prevalence, etc., are subsets.

Risk Ratio: The ratio of the risk of disease or death among the exposed to the risk among the unexposed; this usage is synonymous with relative risk.

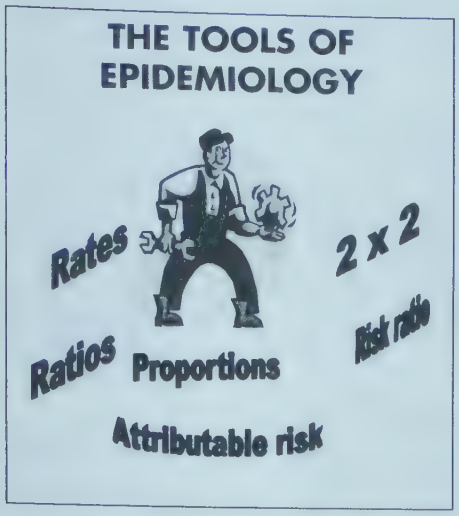
Variable: Any quantity that varies. Any attribute, phenomenon, or event that can have different values.

Variable, dependent: A variable the value of which depends on the effect of other variables [independent variables] in the relationship under study. A manifestation or outcome whose variation we seek to explain or account for by the influence of independent variables.

Variable, independent: The characteristic being observed or measured that is hypothesized to influence an event or manifestation (the dependent variable) within the defined area of relationships under study; the independent variable is not influenced by the event or manifestation but may cause it to contribute to its variation.

Source: U.S. Department of Health and Human Services. Program Management: A Guide for Improving Program Decisions: CDC Atlanta, GA 1986[1]. Last, J.A. (ed). Dictionary of Epidemiology. New York: Oxford University Press. 1983[2].

II. BASIC EPIDEMIOLOGICAL SKILLS FOR NEWBORN HEALTH PROGRAMMING



Epidemiology is the study of the distribution, frequency, and determinants (factors) of health problems in defined populations. The application of epidemiological tools and concepts can be used to assist program managers in understanding and addressing major health problems. Epidemiological tools are useful to identify the major causes of morbidity and mortality, a step toward effective interventions to prevent or treat those causes.

The main aims of epidemiology are to:

- describe and classify diseases in population groups by time, person, and place to make community diagnoses and set priorities for action;
- identify disease determinants in order to enable prevention rather than just offer curative measures; and
- provide information for planning and evaluating health care interventions through analysis of data.

Every health program manager must count, divide, and compare - the basic cycle of applied epidemiology. Within this cycle, there are seven basic epidemiological skills that a program manager requires to make programmatic decisions.

The *count* component includes:

- the ability to distinguish when to use counts, ratios, proportions, and rates.

The *divide* component includes:

- the ability to calculate rates, ratios, and proportions.

The *compare* component includes:

- the ability to understand and use a 2x2 table in processing and analyzing data;
- the ability to use a rate, ratio, or proportion to compare populations;
- the ability to evaluate the "strength" of a risk factor (risk ratio, or odds ratio);
- the ability to estimate the effect of a risk factor on the population by using population attributable risk percent (PAR%); and
- the ability to describe an adverse outcome by time, person, and place using three way tabulations.

FIGURE 2.1
COUNT, DIVIDE, COMPARE CYCLE



A. The Count-Divide-Compare (C-D-C) Cycle

At the Centers for Disease Control and Prevention, CDC stands for more than just its name. It also is an acronym that summarizes what applied epidemiology does: count, divide, and compare (Figure 2.1). The program manager should seek and provide sufficient resources to **count** on a population basis, so that the **division** is a rate, thereby making the **comparison** worthwhile for decision-making.

C-D-C Action 1: Count

At the community level counting is often quite easy. Addition (or subtraction) are daily events performed by everyone, even children. Birth and death counts, a basic function of a government's vital registration systems, enables health care workers to respond to a community's needs. Infectious disease counts often lead to recognition that an epidemic is in progress, particularly in an outbreak in which the population is well-defined, stable, and restricted in time. The community responds better to counts, particularly if the count has a "face." In Section IV, the community monitoring board illustrates how a count (represented by a pin) can be used to monitor the current status of pregnant women, mothers, and babies.

Throughout this section, a series of figures with important epidemiological definitions are given in the order in which they are used in epidemiology. The first figure is an example that will be used throughout this section to provide a practical illustration of the calculations of the different measures in epidemiology that are related to the count, divide, and compare cycle.

FIGURE 2.2
EPIDEMIOLOGICAL EXAMPLE

EXAMPLE

Region A had 2,000 live births in the year 2000. Of 70 neonatal deaths, 20 deaths were due to asphyxia, and 10 of the deaths were in 25 mothers with eclampsia. Three of five maternal deaths were due to eclampsia.

Region B had 4,000 live births in 2000. Of 80 neonatal deaths, five deaths were due to asphyxia, and five of the deaths were in 40 mothers with eclampsia. There was one maternal death due to sepsis.

C-D-C ACTION 1: COUNT

Skill 1. The Ability to Distinguish When to Use Counts, Ratios, Proportions, and Rates.

All program managers count. Counts provide the magnitude of their service load and a means to manage their program. Counts are also the first step in an epidemiological description and analysis of a health problem. Without an ability to count accurately, subsequent conclusions are often misleading, or even wrong. Counts are most often described with one characteristic, i.e., the number of antenatal visits, the number of males or females, the number of low birth weight babies, or the number of neonatal deaths. Later in this section, counts are described and organized in a table with each count having at least two characteristics. This table will form the building block of the program manager's epidemiological analysis.

FIGURE 2.3
EPIDEMIOLOGICAL DEFINITION: COUNTS

COUNTS

Count: The absolute number of cases or events related to a health outcome, i.e., maternal deaths, neonatal deaths.

From Figure 2.12: Cells a, b, c, and d are counts.

From Figure 2.2: Region A had 70 neonatal deaths, and Region B had 80 neonatal deaths. Region B had more neonatal deaths than Region A. Which region has more of a problem? To answer this question, the program manager has to divide.

Although counts are extremely important and are often used to trigger further investigation, they have limited use in epidemiology. In order to translate counts into information, the program manager must compare one count with another count. Unless the population sizes from which the counts came are the same, rates must be used for any comparison. To distinguish when to use a count or rate, the program manager must determine if the counts come from the same population size. If the population sizes are different, rates must be used. Hence, the most important use of counts is as a numerator or a denominator in a fraction that creates a rate. This allows the program manager to make comparisons by time, place, or person with other populations.

C-D-C Action 2: Divide

C-D-C ACTION 2: DIVIDE

SKILL 2. **The Ability to Calculate Ratios, Proportions, and Rates**

As soon as a program manager needs to make a comparison, the program manager must divide. Division is a routine skill that a program manager performs. Understanding the difference in definition, use, and the calculation of ratios, proportions, and rates is an essential skill of a program manager. This skill is critical because without dividing to create rates, the program manager is susceptible to social divisions caused by the unequal distribution of resources. The following definitions of ratios, proportions, and rates with examples will help the program manager with this task.

FIGURE 2.4
EPIDEMIOLOGICAL DEFINITION: NUMERATOR

NUMERATOR

Numerator = The upper portion of a fraction used to calculate a ratio, proportion, or rate.

$$\frac{\textbf{Numerator}}{\text{Denominator}} = \text{fraction}$$

From Figure 2.2: There were 70 newborn deaths in region A. Twenty (20) of the deaths were due to asphyxia. Both numbers might be used as numerators in a fraction, which could either be a rate, ratio, or proportion, as will be demonstrated in future examples.

The numerator is often the most easily obtained component of the fraction. But epidemiology is, in a way, the study of denominators. Identifying the appropriate denominator, the population at risk, is an important skill that the program manager/epidemiologist must develop.

FIGURE 2.5
EPIDEMIOLOGICAL DEFINITION: DENOMINATOR

DENOMINATOR

Denominator = The lower portion of a fraction used to calculate a rate or ratio. The population at risk for the event that is in the numerator in the calculation of a rate.

$$\frac{\textbf{Numerator}}{\text{Denominator}} = \text{fraction}$$

From Figure 2.2: There were 2,000 live births deaths in Region A and 4,000 in Region B. One fraction (20/2,000) is a rate. A second fraction (20/70) is a proportion. The differences between the fractions will be explained in the next few boxes. Understanding the differences and their uses is very important for the program manager.

Three types of fractions that are commonly used are ratios, proportions, and rates. The following figures highlight the definitions and ultimately their important differences that are summarized at the end of the section.

FIGURE 2.6
EPIDEMIOLOGICAL DEFINITION: RATIO

RATIO

Ratio: The value obtained by dividing one quantity by another, a fraction: a general term of which rate, proportion, percentage, prevalence, etc. are subsets.

From Figure 2.12: Any cell (a, b, c, d) divided by any marginal, or even by a number from outside the table, could be a ratio.

From Figure 2.2: Maternal mortality ratio (MMR)=

$$\frac{\text{Number of maternal deaths}}{\text{Number of live births}}$$

There were five maternal deaths in Region A and one in Region B. The MMR for Region A is 5/2,000 (expressed as either 25 per 10,000 or 250 per 100,000 live births).

(A discussion of the stability of this ratio is beyond the scope of the manual, but the program manager should be very cautious of using the MMR in the relatively small populations usually present in district-level programs.)

The numerator and the denominator of a ratio may be related or may be totally independent of one another. The numerator and denominator are usually not from same population when the term ratio is used. The exception to this is the important risk ratio, which is defined later in the section.

The important difference between a proportion and a ratio is that the numerator of a proportion is included in the population defined by the denominator, whereas this is not necessarily so for a ratio.

FIGURE 2.7
EPIDEMIOLOGICAL DEFINITION: PROPORTION

PROPORTION

Proportion: A type of ratio in which the numerator is included in the denominator.

From Figure 2.12: The fraction a / (a+c) would be the proportion of the outcome deaths due to the determinant. Note: The fraction a/(a+c+b+d) x 1,000 would also be a proportion, but it is defined as the rate of the outcome due to the determinant per 1,000.

From Figure 2.2: There are multiple proportions within the case study. The fraction 20/70 (28%) is the proportion of neonatal deaths due to asphyxia in Region A. The fraction 5/80 (6%) is the proportion of neonatal deaths due to asphyxia in Region B. Proportions are commonly expressed as percentages. The proportion of neonatal deaths is higher in Region B than in Region A; yet in the next section, the rate of asphyxiated deaths is higher in Region A than in Region B. It is the rate that is most important in this example.

Every rate is a proportion, but not every proportion is a rate. This is an important concept to understand. Program managers frequently use the "percentage of" something when comparing different situations. These comparisons are dangerous and should be avoided unless the proportion is a rate.

FIGURE 2.8
EPIDEMIOLOGICAL DEFINITIONS: RATE

RATE

Rate: A rate is a measure of the probability of the occurrence of a particular event.

From Figure 2.12: Total outcome rate is equal to (a+c) / (a+b+c+d).
The determinant (risk factor) specific neonatal mortality rate is a/(a+b) x 1,000.
The non-determinant (risk factor) specific neonatal mortality rate is c/(c+d) x 1,000.

The row totals {(a+b) and (c+d)} are subpopulations of the total population. Since cells (a+ b) represent at least a subpopulation, the quantity a/(a+b) is a rate specific for the subpopulation with the determinant. A similar statement can be made for the non-determinant row.

From (Figure 2.2:
Region A:
Sixty (60) neonatal deaths/2,000 live births is the neonatal mortality rate (NMR). The NMR is expressed as 30 per 1,000 live births. There were 20 deaths were due to asphyxia. The NMR due to asphyxia is 20/2,000, or 10 per 1,000 live births.

Region B:
Eighty (80) neonatal deaths/4,000 is the neonatal mortality rate (NMR). The NMR is 80/4,000, or 20 per 1,000. There were 30 deaths due to asphyxia. The NMR due to asphyxia is 30/4,000, or 7.5 per 1,000.

Note: If the program manager had used the proportions calculated in the previous example to determine which region had a more significant problem with neonatal asphyxia, a wrong conclusion would have been drawn and possibly an incorrect action taken.

A rate is a ratio whose essential characteristic is that time is an element of the denominator. Also, there is a distinct relationship between the numerator and denominator in that all of the people in the denominator are at risk for the event in the numerator. The numerator is cases or deaths, and the denominator is the population at risk for the event. A condition of a rate is that time, place, and population must refer to the same period. The key to understanding the difference between rates, ratios, and proportions is the **denominator**[3].

- Rate: the numerator is an event and the denominator is the population at risk for the event.
- Proportion: the numerator is from the same population as the denominator; but the denominator is not the total population at risk for the event in the numerator.
- Ratio: the numerator is from a population different from the denominator.

The key to calculating a rate is obtaining the denominator (the population at risk for the event in the numerator). However, in many settings without basic surveillance or good census data, the denominator is unknown and often has to be estimated. The most commonly used denominator in neonatal health is the number of live births. A simple method to estimate the number of live births for a given area is presented in Figure 2.9.

FIGURE 2.9
TECHNICAL TIP: ESTIMATING THE NUMBER OF LIVE BIRTHS

TECHNICAL TIP

$$\text{Estimated number of live births} = \frac{\text{estimated number of women aged 15- 45 years}}{5}$$

The number of women in an area aged 15-45 years can be estimated from the age structure of the country. In many developing countries, this will range from about 20-40 percent of the total population.

Example: A district has 1 million people, and 35 percent are women aged 15–45 years. Therefore, there are an estimated 350,000 women aged 15–45 years. The estimated number of births is 350,000 / 5 = 70,000. This number (70,000) could be used as the denominator.

Note: This is clearly an estimate to aid decision-making, and more accurate means to determine this denominator should be sought. Both the number of women and the denominator in this equation vary with a given situation.

The two major types of rates are incidence and prevalence. The term *incidence rate* refers to new cases of a given determinant/illness/disease in a population during a time period, so it estimates risk (i.e., STI incidence: new cases of STIs). *Prevalence* refers to all identified cases (new and old) at a given time (i.e., STI prevalence: new and existing case of STIs). Diseases that result in illnesses that last for a long time (i.e., TB) will have a higher prevalence (be more common) in the population than are diseases that have the same incidence rate but last for a shorter time period. A program manager needs to understand and use both incidence and prevalence rates[4].

FIGURE 2.10
EPIDEMIOLOGICAL DEFINITION: INCIDENCE AND PREVALENCE

INCIDENCE AND PREVALENCE

Incidence: The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population. More generally, the number of new events (i.e., new cases of a disease in a defined population) within a specified period. The term incidence is sometimes used to denote incidence rate.

Incidence rate: A measure of the rate at which new events occur in the population. The number of new events (i.e., new cases of a specified disease diagnosed or reported during a defined period of time) is the numerator, and the number of persons in the stated population in which the cases occurred is the denominator.

Prevalence: The number of instances of a given disease or other condition in a given population at a designated time.

Prevalence rate (ratio): The total number of all individuals who have an attribute or disease at a particular time (or during a particular period) divided by the population at risk of having the attribute or disease at this time or midway through the period.

Many rates and proportions are used as indicators. Part Three, Step 4, describes a local indicator matrix that starts with a health outcome indicator, preferably a rate. Other indicators link the outcome indicators with interventions; sometimes this is a rate, but often it is a proportion. Process indicators for the interventions (related to the Five As - availability, accessibility, acceptability, affordability, and appropriateness) are linked to the managerial part of this system. These indicators trigger a response to a health or management problem, which can be addressed using quality management tools.

FIGURE 2.11
EPIDEMIOLOGICAL DEFINITION: INDICATOR

HEALTH INDICATOR

Indicator: A measurement that, when compared to either a standard or a desired level of achievement, provides information on a health outcome or management process.

From Figure 2.2: Examples of indicators include neonatal mortality rate (NMR) and incidence of eclampsia. According to the data in Figure 2.2, the NMR for Region A is 35 and for Region B is 20. The incidence of eclampsia is 12.5 in Region A and 10 in Region B. By comparing indicators like these to a standard or desired level of achievement, the program manager can gain information that is useful for programming. Figure 2.15 provides an example of how this comparison is made.

Health indicators are necessary in order to analyze the current situation, make comparisons, and measure changes over time. Indicators can be absolute numbers, ratios, proportions, or rates. Rates are more useful as indicators because they are less susceptible to bias and misinterpretation. The need for these indicators is a common feature which will be discussed more in Section V[5].

C-D-C Action 3: Compare

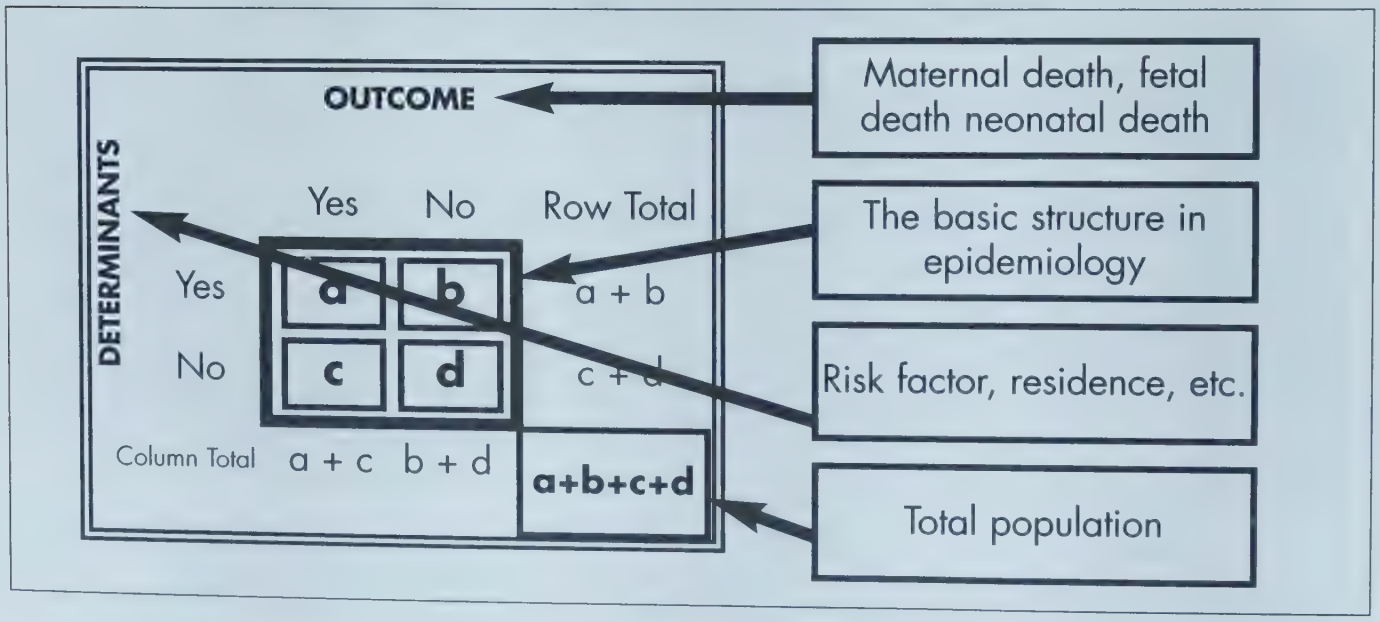
The synonyms for the word compare (contrast, evaluate, balance) take on a situational meaning that helps the program manager make decisions. The key to understanding how to translate data into information for intervention is to know when, what, and how to compare counts, ratios, proportions, and rates. Comparison of rates is the cornerstone of the gap analysis. The gap analysis is conducted by comparing differences between time periods, places, and population groups with use of outcome indicators to expose excess mortality and/or morbidity. This assists a program manager to identify opportunities to target the gaps with specific interventions. Section IV defines BABIES, which is a source of many rates derived from a simple two variable table whose columns are the age-at-death and whose rows are birth weight groups. The gap analysis starts with a comparison of BABIES by time, place, and person. The purpose of the gap analysis is to generate hypotheses that can focus attention on a health problem and its determinants, direct a program manager to the right intervention, and be used as the foundation of a local indicator system (described in Part Three). The local indicator system is absolutely necessary if quality services are to be developed and maintained at the community level.

C-D-C ACTION 3: COMPARE

SKILL 3. The Ability to Understand and Use the 2 x 2 Table

The 2x2 table is a basic analytical structure in epidemiology (Figure 2.12) and the foundation of two-dimensional thinking.[6] It consists of two (2) rows and two (2) columns (hence the name 2x2 table) that have integrated two variables into four cells. Traditionally, the columns are the presence (yes or high) or absence (no or low) of an outcome, (i.e., mortality or morbidity). The rows are the presence (yes or high) or absence (no or low) of a determinant (i.e., risk factor, residence, etc.) of a person who is at risk for the outcome.

FIGURE 2.12
BASIC 2 X 2 TABLE



The cells a, b, c, and d are the counts (absolute numbers) that represent the number of people who have both the value for the outcome and for the determinant. The column and row totals (marginal cells) are the additions of the corresponding cells in the column and row. Rates, ratios, and proportions are defined by the way these different cells relate to one another as a numerator and denominator. Cells a, b, c, and d are used as either an absolute number or a numerator in a fraction, but they are never used as a denominator. Column and row totals can be used as either a numerator or denominator. The marginal used determines whether the measurement is a ratio, proportion, or rate. The most important denominator cell is the cell in the lower right-hand corner because it represents the total population.

TABLE 2.1
SUMMARY OF EPIDEMIOLOGICAL DEFINITIONS FROM 2X2 TABLE

TERM	EXAMPLE FROM FIGURE 2.12
Counts	Cells a, b, c, and d.
Numerator	Cells a, b, c, and d.
Denominator	Any marginal (the addition of any column or row in the 2x2 table) is a potential denominator(i.e., a+c, c+d, a+b+c+d).
Sup-population	Population with outcome: (a+c). Population without outcome: (b+d). Population with risk factor: (a+b). Population without the risk factor: (c+d).
Total population	a+b+c+d.
Ratio	Any cell (a, b, c, d) divided by any marginal, or even by a number from outside the table, could be a ratio.
Proportion	The fraction a / (a+c) would be the proportion of the outcome deaths due to the determinant. Note that the fraction a/(a+c+b+d) x 1,000 would also be a proportion, but it is defined as the rate of the outcome due to the determinant per 1,000.
Rate	Total outcome rate is equal to (a+c) / (a+b+c+d). The determinant (risk factor) specific mortality rate is a/(a+b) x 1,000. The non-determinant (risk factor) specific mortality rate is c/(c+d) x 1,000.
Incidence rates	a/(a+b)
Risk ratio (RR)	RR is defined as (a/(a+b))/ (c/(c+d)). This can be calculated mathematically by a(c+d)/c(a+b).
Attributable risk percent (AR%)	$AR\% = \frac{\{(a+b)/(a+b+c+d)x(RR-1)}{1 + \{(a+b)/(a+b+c+d)x(RR-1)} \times 100$

C-D-C ACTION 3: COMPARE

SKILL 4. The Ability to Use a Rate, Ratio, or Proportion to Compare Populations

To evaluate a program, a program manager must use two things: a measurement and a comparison. Rates, ratios, and proportions are measurements, but the only measurement a program manager should use to compare is a rate (or a ratio of rates). Comparisons of non-rates, non-ratios or non-proportions are most often misleading, and even wrong. The following example reinforces the points made in the example being used throughout this section. It demonstrates some misleading conclusions resulting from using measurements other than rates.

FIGURE 2.13
WHY USE RATES?

Example: In area A, there are100 neonatal deaths, and 20 of the deaths are due to neonatal asphyxia. In area B, there are also 100 neonatal deaths, and five deaths are due to neonatal asphyxia.

- Conclusion 1: Area A has the same number of deaths as Area B (ratio 100/100=1).
- Conclusion 2: Area A has four times the number of deaths due to asphyxia compared to Area B (ratio 20/5=4).
- Conclusion 3: In Area A, 20 percent of the neonatal deaths are due to asphyxia, but it is 10 percent in Area B (proportion).

However, in Area A, there are 5,000 live births. In Area B, there are 2,000 live births. The neonatal mortality rate in Area A is 20 per 1,000(100/5,000). In Area B, it is 50 per 1,000 (100/2,000). The mortality rate due to asphyxia is 4 per 1,000 (20/5,000) in Area A, and 2.5 per 1,000 (5/2,000) in Area B.

Very different conclusions are drawn in this example when rates are used.
Message: Use rates!

Although beyond the scope of this manual, epidemiological concepts such as sensitivity, specificity, predictive values, and alpha and beta error can be more easily understood and used when one has a more complete understanding of the 2x2 table[7].

C-D-C ACTION 3: COMPARE

SKILL 5. The Ability to Evaluate the Strength of a Risk Factor

The risk ratio enables a program manager to compare one determinant with another determinant to assess the strength of the association between the determinant and the outcome. Different determinants (risk factors) have stronger or weaker effects on the outcome. For example, a baby who is 35 weeks gestation at birth may have an eight-fold higher risk of dying than a baby who is born at term. The number eight was determined by calculating the ratio of the mortality rate in those who were 35 weeks gestation (numerator) with the mortality rate of those infants whose gestational age was 38 weeks (denominator).

$$\frac{\text{Neonatal mortality rate for babies born at 35 weeks}}{\text{Neonatal mortality rate for babies born at 38 weeks}}$$

Risk may also be dose related. For example, a baby born at 28 weeks would have a much higher risk of dying than the 35- week-gestation baby.

One risk factor may be associated with several diseases, such as a preterm birth being related to an increased probability of respiratory problems, asphyxia, jaundice, sepsis etc. Conversely, one outcome may be associated with a number of risk factors. For example, LBW is related to malaria, smoking, under-nutrition, etc. To prioritize different interventions to reduce LBW, the program manager needs to evaluate the strength of different risk factors.

If the data are based on new cases of the outcome collected prospectively, then it can assume that the risk ratio, or strength of the risk of the condition, is equivalent to the risk. If the data are based on a case control study, then the appropriate measure of risk is the odds ratio. In certain situations the odds ratio approximates the risk ratio, but a discussion of this is beyond the scope of this manual..

FIGURE 2.14
EPIDEMIOLOGICAL DEFINITION: RISK RATIO

RISK RATIOS

Risk ratio = The risk ratio or probability of the condition among those exposed to the risk factor (or treatment) compared to the risk of the condition in those not exposed. It is expressed as a ratio. The rate of those with the risk factor is the numerator and the rate of those without the risk factor is the denominator. The risk ratio requires prospectively collected data.

From Figure 2.12: The risk ratio is defined as: (a/(a+b))/ (c/(c+d)) This can be calculated mathematically by a(c+d)/c(a+b).

From Figure 2.2:
Region A:
The NMR for newborns born to mothers with eclampsia is 10/25, or 400 per 1,000. The NMR for newborns born to mothers without eclampsia is 60/1,975, or 30.4 per 1,000. The risk ratio of neonatal mortality for eclampsia is 400/30.4 = 13
Region B:
The NMR for newborns in born to mothers with eclampsia is 5/40, or 125 per 1,000. The NMR for newborns born to mothers without eclampsia is 75/3,960, or 18.9 per 1,000. The risk ratio of neonatal mortality for eclampsia is 125/18.9 = 7.

A program manager needs to compare newborns born in to mothers with eclampsia in Region A with those born in Region B. The risk ratio in this case is 400/125 =3.2. Women in Region A are 3.2 times more likely to develop eclampsia than the women in Region B. The program manager should investigate this inequity.

Odds ratio = odds of exposure among the cases, compared to the odds of exposure among the controls. The data come from case control studies and may approximate the risk ratio in certain situations.

In reality, most program managers will not carry out studies that provide data for the risk ratio and odds ratio calculations, but understanding the principles is for the decision-making process. More details on the formulas and how to calculate them are available on the attached CD-ROM. More important is that the program manager may use the risk ratio in the calculation of the attributable risk percent described in the next section.

C-D-C ACTION 3: COMPARE

SKILL 6. The Ability to Estimate the Impact of a Risk Factor on the Population (Attributable Risk Percent)

The attributable proportion, also known as the attributable risk percent, is a measure of the public health effect of a condition. Thus, the attributable proportion is the proportion of disease in an exposed group due (attributable) to the exposure. It represents the expected reduction in disease if the exposure could be removed (or never existed). In calculating this measure, we assume that the occurrence of disease in a group not exposed to the factor under study represents the baseline or expected risk for that disease. Any risk in the exposed group above that level will be attributed to their exposure.

FIGURE 2.15
EPIDEMIOLOGICAL DEFINITION: ATTRIBUTABLE RISK PERCENT

ATTRIBUTABLE RISK

Attributable risk percent $= \dfrac{f(RR-1)\ \times 100}{1+f(RR-1)}$

where risk ratio is equal to the risk ratio, and f is equal to the frequency of the risk factor in the population.

The attributable risk percent measures the effect of a given determinant on the health of a population. The effect depends on:

- the strength of the association of the determinant with the outcome, measured by the risk ratio; and
- how common the determinant is (the prevalence).

This means that a common determinant with a low risk of death may have more effect on the health of a population than a condition with a very high, but rare risk.

From Figure 2.12: Attributable Risk Percent $= \dfrac{\{(a+b)/(a+b+c+d)x(RR-1)}{1+\{(a+b)/(a+b+c+d)x(RR-1)} \times 100$

From Figure 2.1:
The AR% for eclampsia in Region A is 13%.
The AR% for eclampsia in Region B is 5%.

Table 2.2 is the cornerstone for policy decisions from an epidemiological perspective[8]. It is also a good example of the two-dimensional thinking required of program managers. This table is a comparison of the different attributable risk percent achieved with different risk ratios and frequencies of a determinant. The different values of the risk ratio are the columns, and the values of the frequency of the determinant in the population are the rows.

For a given frequency (row), the attributable risk percent increases with increasing risk ratio. For a given risk ratio (column), the attributable risk percent increases with increasing frequency. Different strategies can be considered according to the different combinations of the risk ratio and frequency of the determinants. For example, in Table 2.2 the two highlighted cells represent two scenarios. In one scenario, 10 percent of the population has a determinant with a risk ratio of 4. The expected reduction in the mortality rate is 23 percent. In the next scenario, the frequency is 50 percent, but the risk ratio is 1.75. However, the attributable risk percent is 27 percent. The program manager will have to decide which strategy to choose on the basis of this difference and other factors discussed in later (Table 2.2).

TABLE 2.2
VARIATION IN ATTRIBUTABLE RISK
BY CHANGE IN RISK RATIO AND FREQUENCY OF DETERMINANT

Frequency (f) of Determinant	Risk Ratio (RR)					
	1.3	1.5	1.75	2	3	4
10%	3%	5%	7%	9%	17%	23%
20%	6%	9%	13%	17%	29%	38%
30%	8%	13%	18%	23%	38%	47%
40%	11%	17%	23%	29%	44%	55%
50%	13%	20%	27%	33%	50%	60%
60%	15%	23%	31%	38%	55%	64%
70%	17%	26%	34%	41%	58%	68%
80%	19%	29%	38%	44%	62%	71%
90%	21%	31%	40%	47%	64%	73%
100%	23%	33%	43%	50%	67%	75%

More Frequent Condition

More Serious Condition

A program manager might ask, *What if I do not have the risk ratio value or the frequency of the risk factor in the population?* At first, it would not be unreasonable to estimate their values. The program manager can consult with a clinical adviser or use the results of studies of similar situations. For an institution, such as a regional hospital, the risk ratio used could be that found in the facility, with the appropriate caution that should be observed in the use of facility-based populations. The ability to treat a condition successfully influences its risk ratio. Therefore, if the program manager is aware that within the setting the capacity to treat the condition is diminished or nonexistent, the risk ratio value could be placed in the range of 3-4.

With regard to frequency, program managers cannot manage the condition if the frequency is unknown. They need to establish a system that can give good counts. The frequency can also be estimated from the previous population surveys or patient load at the facilities with the risk factor - with the same caution regarding population versus facility-based profiles. Epidemiologists worry about the unknown bias, but a known bias can be handled through interpretation and stipulations. The program manager can make decisions regarding that factor in the reliability of the data.

Table 2.3 is a summary of the terms illustrated by using the basic 2x2 table (Figure 2.12).

TABLE 2.3
SUMMARY OF BASIC 2X2 TABLE
AND SELECTED DEFINITIONS FOR THE EXAMPLE IN FIGURE 2.2

General Principles

	NEONATAL DEATH +	NEONATAL DEATH -	TOTAL
ECLAMPSIA +	**a**	**b**	a+b
ECLAMPSIA -	**c**	**d**	c+d
TOTAL	a+c	b+d	a+b+c+d

Maternal death	n
Maternal death (eclampsia)	m

Count (neonatal deaths)	a, b, c, or d
Proportion ND (eclampsia)	a/(a+c)
Neonatal Mortality Rate	(a+c)/(a+b+c+d) x 1,000
Neonatal Mortality Rate (eclampsia)	a/(a+b) x 1,000
Neonatal Mortality Rate (no eclampsia)	c/(c+d) x 1,000
Incidence eclampsia	(a+b)/(a+b+c+d) x 1,000
Risk Ratio (eclampsia)	a/(a+b)/c/(c+d)
Attributable Risk Percemt (eclampsia)	{(a+b)/(a+b+c+d)/(RR-1)} 1+{(a+b)/(a+b+c+d)x(RR-1)
Maternal Mortality Rate	n/(a+b+c+d) x 100,000
Maternal Mortality Rate (eclampsia)	m/(a+b+c+d) x 100,000

Region A example: Region A had 2,000 live births in 2000. Of 70 neonatal deaths, 20 deaths were due to asphyxia, and 10 of the deaths were in 25 mothers with eclampsia. Three of five maternal deaths were due to eclampsia.

Region A

	NEONATAL DEATH +	NEONATAL DEATH -	TOTAL
ECLAMPSIA +	**10**	**15**	25
ECLAMPSIA -	**60**	**1,915**	1,975
TOTAL	70	1,930	2,000

Maternal death	5
Maternal death (eclampsia)	3

Count	70
Proportion ND (eclampsia)	14%
Neonatal Mortality Rate	35
Neonatal Mortality Rate (eclampsia)	400
Neonatal Mortality Rate (no eclampsia)	30.4
Incidence eclampsia	12.5
Risk Ratio (eclampsia)	13
Attributable Risk Percemt (eclampsia)	13%
Maternal Mortality Rate	250
Maternal Mortality Rate (eclampsia)	150

Region B example: Region B had 4,000 live births in 2000. Of 80 neonatal deaths, five deaths were due to asphyxia, and five of the deaths were in 40 mothers with eclampsia. There was one maternal death due to sepsis.

Region B

	NEONATAL DEATH +	NEONATAL DEATH -	TOTAL
ECLAMPSIA +	**5**	**35**	40
ECLAMPSIA -	**75**	**3,885**	3,960
TOTAL	80	3,920	4,000

Maternal deaths	2
Maternal death (eclampsia)	0

Count	80
Proportion ND (eclampsia)	6%
Neonatal Mortality Rate	20
Neonatal Mortality Rate (eclampsia)	125
Neonatal Mortality Rate (no eclampsia)	18.9
Incidence eclampsia	10
Risk Ratio (eclampsia)	7
Attributable Risk Percemt (eclampsia)	5%
Maternal Mortality Rate	50
Maternal Mortality Rate (eclampsia)	0

"Chance" as an explanation for the difference between Region A and Region B is assessed by performing statistical tests. Further explanation of this and a description of the statistical tests are beyond the scope of this manual. Further reading is accessible on the CD-ROM.

C-D-C ACTION 3: COMPARE

SKILL 7. The "Opportunity Gap" Described by Time, Person and Place

The excess morbidity and mortality for mothers and babies in the developing world is due to an inability to implement interventions already known to be effective for either preventing or treating the excess. Program managers need to respond to differences in morbidity and mortality between districts and sub-populations within districts.

FIGURE 2.16
EPIDEMIOLOGICAL DEFINITION: "OPPORTUNITY GAP"

OPPORTUNITY GAP

Gap: A gap, or excess, is a disparity between mortality or morbidity rates among populations or subpopulations. The gap represents a potential for reduction in excessive mortality based on a comparison between rates already achieved by one subpopulation in a defined geographical area with those experienced by the remaining population represents a program manager's objective.

The difference in the rates represents an opportunity for the program manager to reduce the excessive mortality or morbidity, hence the "Opportunity Gap."

Example from Figure 2.2: A gap analysis of the data for Region A and Region B reveals several health disparities. For example:
1. The NMR for Region A is 35. Region B has an NMR of 20. This produces a "gap" of 15 (35-20=15).

2. The NMR due to eclampsia is 400 in Region A and 125 in Region B. There is a "gap" in this health outcome of 275 (400-125=275).

3. Region A has an attributable risk of 13%. The attributable risk in Region B is 5%. The "gap" between these regions for attributable risk is 8% (13-5=8).
It is the job of the program manager to determine why these gaps exist.

A more complete discussion of the "Opportunity Gap" is found in Section IV after the explanation of BABIES.

A common way to describe the "Opportunity Gap" in terms of time, place and person.

Time: Changes over time are important to describe health problems. Is the problem increasing, decreasing, or remaining the same? It is important to document changes in health status, population characteristics, access to resources, access to health services. Monitoring changes over time provides the means to determine whether populations are being adequately served.

Several aspects of time can be analyzed. Three are discussed in this section.

- **Age at death:** This information provides considerable insight as to the circumstances surrounding the event, particularly to what extent acute care services should have been provided to prevent or alter the outcome of the event.
- **Time of preventive intervention:** Acute care services that provided secondary prevention of mortality are usually more costly than preventive measures. It is important to analyze events with the idea of primary prevention. For example, preventing LBW newborns is less costly than taking care of LBW newborns.
- **Seasonal or day of the week occurrence:** Service loads and seasonal exposures can be evaluated when these aspects of time are considered.

Place: The characteristics of key events by residence status or place of occurrence are essential to epidemiological description. Once again several categories can be useful in this analysis:

- ✤ region, district or village;
- ✤ urban versus rural; and
- ✤ health institution versus home.

It is important to determine whether differences in geography (i.e., villages, districts) represent distinctive features of the political, economic, social, or health service environment. It is often important to aggregate the data into larger geographical units to gain insight into the relationship between the risk factors and outcome. This analysis can also suggest whether different types of interventions are needed in various geographical locations. Similar analyses can be conducted to assess the differences between rural and urban settings. For example, women and their families often utilize health services less in rural or peri-urban areas than in urban areas. Because most births and deaths occur at home, it is important to compare characteristics between the women who deliver at home and those who go to an institution. For example, a comparison of where the mother has her official residence versus where the event occurs may reveal whether the distance traveled to receive a service may result in an accessibility problem.

Person: Personal characteristics are fundamental to the description of the health of a population. Examples of personal characteristics include:

- ✤ age;
- ✤ sex;
- ✤ race;
- ✤ marital status;
- ✤ socioeconomic status; and
- ✤ behaviors.

Some personal characteristics cannot change, such as age, sex, and race. However, other characteristics can change over time such as education, income, health-seeking practices, and medical conditions. The most important information derived from the person analysis is the identification of "equity." For example, are teenage mothers less likely than older women to deliver with a skilled provider?

Profiles are combinations of personal characteristics that can be grouped together in a single variable with multiple categories. A common combination is race, maternal age, and education. For example, there are eight categories in the socio-demographic profile created by grouping each of the previous variables into two groups race (Group A and Group B), maternal age (less than 20 and greater than or equal to 20 years), and maternal education (less than six and greater than or equal to 6 years of completed education).

TABLE 2.4
EXMAPLES OF PROFILE GROUPINGS

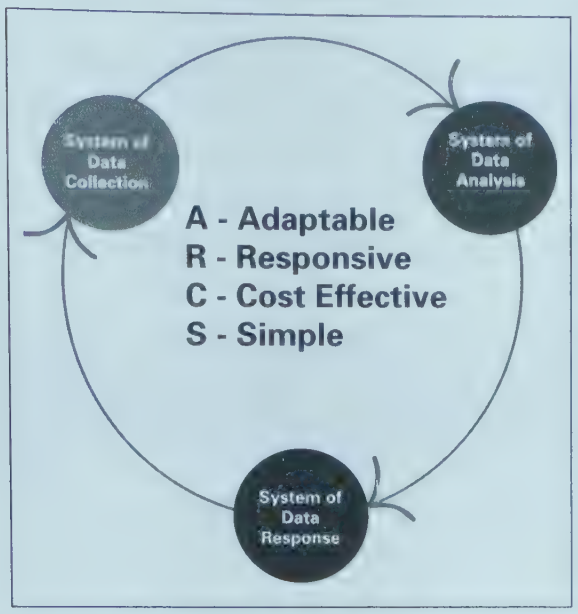
GROUP	RACE	MATERNAL AGE	MATERNAL EDUCATION
1	A	≥ 20 years	≤ 6 years
2	A	≥ 20 years	≥ 6 years
3	A	≤ 20 years	≤ 6 years
4	A	≤ 20 years	≥ 6 years
5	B	≥ 20 years	≤ 6 years
6	B	≥ 20 years	≥ 6 years
7	B	≤ 20 years	≤ 6 years
8	B	≤ 20 years	≥ 6 years

Other frequently used profile combinations include maternal age, parity, and birth interval as a family planning profile; medical conditions not related to pregnancy and medical conditions related to pregnancy. The latter can be combined with a contact variable (first contact, last contact, intrapartum contact) to provide a risk assessment combination for assessing the change in risk status throughout the pregnancy.

The ability to describe the "Opportunity Gap" in terms of time, place, and person provides the program manager with the insight necessary to generate hypotheses to explain the inequities observed in the population being served. This serves as the means to target specific interventions for specific populations while providing basic coverage for all.

III. BUILDING A HEALTH MANAGEMENT INFORMATION SYSTEM FOR HEWBORN HEALTH

FIGURE 2.17
ACTIONS AND ATTRIBUTES OF AN HMIS



An HMIS is a simple system that takes the most basic pieces of data and transforms them into valuable information that can easily be used for program decision-making. Although global indicators are pertinent to international policy, data collected by a local HMIS should be used first and foremost to guide local decisions.

An HMIS is a *dynamic process* that enables one to collect, analyze, and respond to data about the occurrence and distribution of outcomes for a population within a given geographical location (Figure 2.17).

Several crucial points apply to a successful HMIS.

- Building an HMIS involves collecting selected pieces of data that are chosen because they can be transformed into information for decision-making about interventions.
- An HMIS is a dynamic system that needs to be reviewed constantly to maintain its relevance.
- An HMIS must involve key stakeholders, including the health care providers, the community, and other key decision-makers in a particular setting.
- An HMIS enables an ACTION to be taken on the basis of data, thereby allowing management by fact.

A. Translating Data into Information

Data are facts that are recorded. The collection of data is not valuable in itself-- data are valuable when they are transformed into information to make decisions about interventions to improve outcomes. Unfortunately, many data that are collected are never used for decision-making. Additionally, the existing data often reflect an underreporting of deaths, especially deaths among LBW babies who die in the late fetal and early neonatal periods, as outlined in Part One. Many barriers to collecting data on maternal, fetal, and neonatal deaths can be overcome. Nearly all countries collect some data on maternal and neonatal mortality, and existing data can be better used to identify or address maternal and neonatal problems. In Section IV, some tools - namely, BABIES - are provided to assist program managers in using these data.

Data are records of facts or events and are often recorded as absolute numbers. Information is a "difference that makes a difference."

Information comes from data that have been organized in specific ways and compared to standards in order to empower decision-making. In the definition of a health problem, information is the difference between what is expected and what is observed. In the definition of a management problem, information is the difference between what is supposed to happen and what is actually happening.

Accounting for every pregnancy

Most data are available at the health center or hospital level, but most fetal-neonatal deaths throughout the developing world occur at home in the absence of skilled providers. Women who deliver at home often differ (i.e., in economic status, distance to the facility, and education) from those who seek services in a health care facility. Therefore, to obtain a complete picture of both maternal and fetal-neonatal mortality and their causes, it is important to account for all pregnant women and their deliveries.

> Every pregnancy counts.....
> so account for every pregnancy.

Accounting for every pregnancy does not entail a complicated, hi-tech approach, but it does require a committed effort on the part of the formal and informal sectors of the HCDS.

Counting and weighing every newborn

Weighing every newborn does NOT imply a need for digital scales. Simple technology for weighing, such as a spring balance, is all that is needed for decision-making. Even in the absence of this equipment, broad classifications of normal and LBW are usually adequate to design programs that address the main newborn health problems. Once again, a commitment by the HCDS is needed to ensure that the recording of births and deaths is a priority.

> Every newborn counts and has a weight.....
> so count and weigh every newborn.

Characteristics of an HMIS

A system is more likely to function accurately if it supplies the people collecting the data with useful information. The essential attributes of such a system are that it is adaptable, responsive, cost-effective, and simple for the existing situation (Figure 2.7).

Adaptable: The system must be capable of being modified or adjusted readily to changes in the environment or meeting the requirements of a given situation.

Responsive: The system must answer the minimal questions that lead to alternative courses of action. It must be sensitive to change and specific enough to point out if new directions should be taken. Most important, it must meet the needs of the people who are collecting the data. Responsiveness implies relevance to each component of the HCDS.

Cost-effective: The system must be inexpensive in terms of physical resources and manpower, but at the same time effective. Efficiency is a primary objective from the very beginning of its design. An important lesson is to build on an already existing system. An old system with known deficiencies is better than a new system with unknown deficiencies. Rarely is there a need to totally dismantle a system and start over.

Simple: The system must be basic so that it is readily understood by all those who will be working with it. More complex systems can answer more sophisticated questions, but are more susceptible to malfunction. The HMIS only needs to raise a "red flag" indicating that further investigation is warranted. More sophisticated studies may be performed after the red flag is raised.

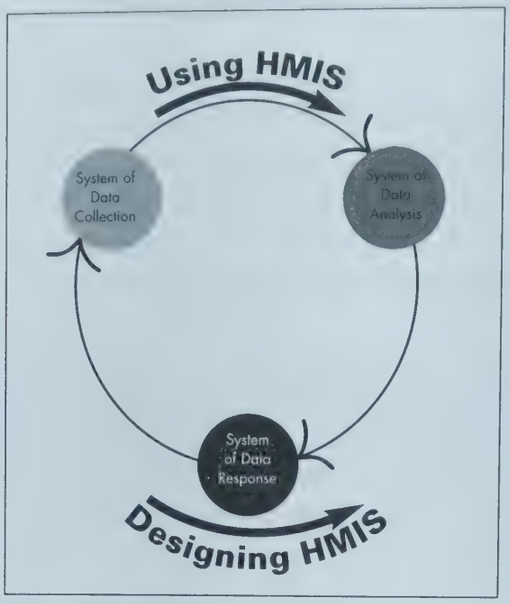
Various components of the HCDS have different roles in the HMIS (Table 2.5). Data collected at any level must be usable at that level. Data collected at the primary level can be passed on to the district or national level to provide aggregated data for programmatic review, but it should be used and understood at the level collected. Each component of the HCDS has an important role in the information system.

TABLE 2.5
SURVEILLANCE ROLES OF EACH COMPONENT IN THE HCDS

COMPONENT	COLLECTION	ANALYSIS	RESPONSE
Informal (community)	Participate in birth registration. Maintain home-based maternal record. Participate in focus groups and other participatory methods of data collection.	Participation in design and implementation of HMIS.	Take appropriate community action to respond.
Formal	Keep routine service statistics. Undertake special surveys, i.e., HIV prevalence. Contribute to vital registration system.	Analysis of service statistics and surveys.	Take appropriate action to resolve issues of service coverage or quality.
Intersectoral	Maintain vital registration system. Perform periodic census data collection.	Analyze data with respect to possible intersectoral action.	Promote supportive policy and solutions to identify problems.

B. Designing a Basic Health Management Information System (HMIS)

FIGURE 2.18
USING AND DESIGNING AN HMIS



In many settings, data are collected on the basis of what can be collected, rather than what needs to be collected. The data that need to be collected are data that support important program decisions, or answer key management questions. The HMIS should enable the program managers and stakeholders to focus on the desired heath outcome and intervention results. A difference in the desired level of health outcome, or the desired results in the implementation of interventions, should be apparent, leading to appropriate decisions.

When designing an HMIS, program managers need to identify the key decisions they make, and what questions will need to be asked and answered to make those decisions. When the HMIS is used in the field the first action is data collection, the second is data analysis, and the third is a response (a clockwise rotation as seen in Figure 2.18). However, when designing an HMIS, the reverse order is used as discussed below.

1. **HMIS Action 1: Data response:** To which differences will the program manager respond? What decisions have to be taken regarding these differences? What information will help in these decisions? What questions need to be answered before a response can be made?

2. **HMIS Action 2: Data analysis:** What type of analysis is needed to provide the information necessary to make the decision?

3. **HMIS Action 3: Data collection:** What are the minimum data and the simplest way to collect these data that are needed to obtain the required information?

Therefore, the first action in designing the system is to determine the response required, the second action is to define how the data will be analyzed, and the third action is to describe data collection including processing and tabulation (a counter-clockwise rotation as seen in Figure 2. 18). This may seem like a subtle difference, but it is an important distinction. These actions allow the focus of the HMIS to be on the outcome. It results in a system that collects only the data required to measure the desired outcome and the process data related to the interventions. This method of HMIS design prevents project managers from obtaining large amounts of data without a clear link to the outcome.

HMIS ACTION 1 Data Response

Data are intended for use by decision-makers at all levels of the HCDS to plan, implement, and evaluate an organized response. At the local level, data are collected with a dual purpose. The health care worker collects data on an individual patient and uses it to manage the patient. The district health officer aggregates the same data to manage the local program. The aggregated district data are then passed up the chain of command for higher-level policy makers. Every level of the HCDS uses the data and should be expected to respond. When the data are appropriately analyzed and disseminated to decision-makers at each level, the HMIS can provide the ability to manage by fact. When programs are managed by fact, high-quality services can be delivered.

> Information is a powerful weapon
> to improve maternal, fetal, and neonatal health.

A system that collects data only but does not respond, or responds in an inappropriate way, does a disservice to the people who collected the data and ultimately to the people being served. Poorly operated systems result in unreliable data being collected, lack of interest on the part of the people collecting the data, and inappropriate decisions being made. The adage "garbage in, garbage out" applies. In contrast, when the appropriate feedback mechanisms are established, the quality of the data is increased, good decisions are made, and services prevent undesirable outcomes.

The most important consideration when developing a set of indicators is to define the expected response within each sector of the HCDS and also at each level of the formal health care system. For example, if neonatal tetanus cases are chosen as an indicator and the number of cases is above a defined target level, there should be action taken by (among others):

- the community (i.e., behavior change of traditional practices);
- the formal health care system locally (i.e., clean delivery standards);
- the public health authorities (i.e., improved support for tetanus toxoid immunization); and
- the intersectoral system (i.e., incorporating school girl tetanus toxoid immunization).

HMIS ACTION 2 Data Analysis

The second component of the HMIS is an orderly arrangement and analysis of the data. Data should be processed in a timely manner to ensure their relevance. It is very important to strengthen the capabilities of communities and districts to analyze data and use them at the local level. Experienced personnel should analyze the data, but they should also participate in building the analytical capacity of each level of the HCDS. The data should be translated into information and presented in such a way that the options are easily understood at all levels. The main method of analysis should identify the "Opportunity Gap." This method, briefly described in the previous section and more completely defined in Section IV, compares observed results with expected results to determine which interventions should be emphasized. The expected results can be derived either from a standard in another country or from a subpopulation within the same country.

The steps to improve analysis at the local level include:

- a simple framework (such as BABIES) to facilitate assessment, intervention, and monitoring in the community;
- intervention/surveillance areas to provide prospective community-based surveillance with targeted interventions;
- using simple technology to record weight at birth and including this on birth certificates and client cards;
- strengthening the civil registration systems to improve coverage and quality of perinatal data; and
- using "tick" tables with multiple variables; tick tables have multiple dimensions that enable a single "tick" to be placed in a cell of the table and to represent more than one variable for a given person.

Specific objectives for the analysis depend upon the stage of the management cycle and on the questions that have been raised by the management cycle process. The analytical framework is more completely outlined in Section IV on BABIES. Familiarity with a computer statistical package is very helpful if more complex analyses are needed. The WHO/CDC package EPI INFO 2000 can be downloaded free from the Internet site given on the CD-ROM.

HMIS ACTION 3 Data Collection

HMIS ACTION 3

TASK 3.1 Define What Data to Collect

The data needed comes from conducting a process that identifies the intended response and the type of analysis required by a given situation. From experience, the minimum key data are listed in Table 2.6. The table also lists how the variables might be coded, the outcome information and possible analysis, and the possible response. In a given setting other relevant information, such as prevalence of malaria or syphilis in pregnant women, will be needed.

HMIS ACTION 3

TASK 3.2 Determine Where and How to Collect the Data

Quantitative data give a general idea of the magnitude of a problem, but qualitative data usually help to understand the whys. Therefore, it is necessary to collect both qualitative and quantitative data to fully understand the situation and select the most effective interventions for that context.

Quantitative data collection can include gross indicators of health status (i.e., maternal mortality rate, infant mortality rate, total fertility rate, contraceptive prevalence rate, and service coverage rates). They also reflect the availability and accessibility of the health infrastructure (i.e., available equipment, health facilities per population, use of facilities). Data collection instruments may include structured record review, structured interviews with clients, and health facility assessments. Instruments to be used in the communities may consist of Knowledge, Attitude, and Practice (KAP) surveys or some adaptation. These tools are characterized by closed-ended questions. There are many surveys available (i.e., Demographic and Health Survey (DHS) module on maternal mortality, WHO Health Facility Assessment, American College Nurse Midwives (ACNM) Assessment) that have been tested and can be adapted.

Qualitative data collection includes beliefs and practices about pregnancy, delivery, postpartum care, newborn care, the community perception of health facilities and staff, and the decision-making processes for access to care for mothers and babies. Instruments to collect qualitative data include focus groups, participatory approaches, and verbal autopsies. Focus groups are guided discussion groups that provide more in-depth information on many topics, particularly about beliefs, perceptions, and issues that affect quality of care. Such groups are useful to further explore trends seen in the quantitative data to better understand them. Participatory approaches, such as participatory rural appraisals (PRA) or participatory learning in action (PLA) are other alternative collection forms for qualitative data. Typically, PRA and PLA involve community groups (i.e., men, women, elders, providers) to collect diverse information. Because data are collected from several sources, it is important to triangulate them (cross-reference through the use of different tools that enable the collection of the same data in different ways) to ensure their validity. A variety of tools (i.e., village mapping, reproductive life cycling) can be used to assist the community in describing their situation and beliefs. The aim of these approaches is to enhance the learning of all the participants.

TABLE 2.6
EXAMPLE OF ESSENTIAL DATA TO COLLECT FOR A MINIMUM DATA SET FOR NEWBORN HEALTH IN A GENERAL HMIS

DATA TO COLLECT	CODING OF VARIABLE	OUTCOME INFORMATION AND POSSIBLE ANALYSIS	POSSIBLE RESPONSE TO DATA AT POPULATION LEVEL
Maternal age.	Years old at last birthday.	Perinatal mortality rate (PMR), stillbirth rate (SBR), neonatal mortality rate (NMR), analysis by age.	Address unmet need for family planning delay/space/prevent pregnancy.
Residence.	Urban, rural.	PMR, SBR, NMR analysis by place.	Address gaps in outcome by area.
Obstetrical history.	Normal, abnormal.	PMR, SBR, NMR analysis by obstetric history.	Are women with abnormal previous history getting good care now?
Place of delivery.	Home, health center, hospital.	Home delivery rate. Institutional delivery rate. Mortality by place of delivery.	If many deaths are occurring at home, why is this? Lack of access or quality?
Attendant at birth.	Untrained/trained TBA, midwife, doctor.	Coverage with skilled attendant at birth.	Increase coverage of skilled attendant. If high coverage, increase quality
Mode of delivery.	Vaginal, C-section, other operative.	Method of delivery rate. C-section rate.	Assess unmet need for emergency obstetrical care (if C-section is <5%, this is too low).
Date of birth.	mm/dd/yr	Analysis by time of LBW rate of fetal/neonatal deaths or of service coverage.	Are outcomes improving with time? If not why not?
Birth weight.	VLBW (<1500 g). IBW (1500-2499 g). NBW (>2,500 g).	VLBW rate, IBW rate. BW specific mortality rates. Birth weight by age at death analysis (BABIES).	Maternal health strategies, (FP, nutrition, female literacy) intersectoral action.
Sex.	Male, female.	Sex-specific PMR, NMR.	Policy and educational support to reduce gender preference, selection.
Plurality.	Singleton, multiple.	PMR, SBR, NMR by plurality.	Are multiple pregnancies receiving appropriate care and experiencing good outcomes?
Gestational age.	In weeks by last menstrual period. Premature (less than 37), Mature(37-42), Postmature (more than 42).	Preterm birth rate. Rate of IUGR in term babies.	Interventions to reduce LBW addressing preterm birth or IUGR or both.
Breastfeeding in the first hour.	Yes, no.	Rate of early breastfeeding.	Improve policy and support of early breastfeeding.
Exclusive breastfeeding at 1 month.	Yes, no.	Rate of exclusive breastfeeding at 1 month.	Improve policy and support of exclusive breastfeeding.
Cause of death	Cause, i.e., sepsis, asphyxia, tetanus, birth defect.	Cause by birth weight, place of delivery, age.	Address specific causes for certain populations.
Birth outcome.	Alive, stillbirth (fresh, macerated).	BABIES is described in the next chapter. Birth weight specific mortality rates.	Birth weight mortality rates are used to make major decisions about the choice of intervention and the quality of the intervention being implemented.
Age at death.	Weeks of gestation or Days after birth.		

HMIS ACTION 3

TASK 3.3 Define the Types of Data

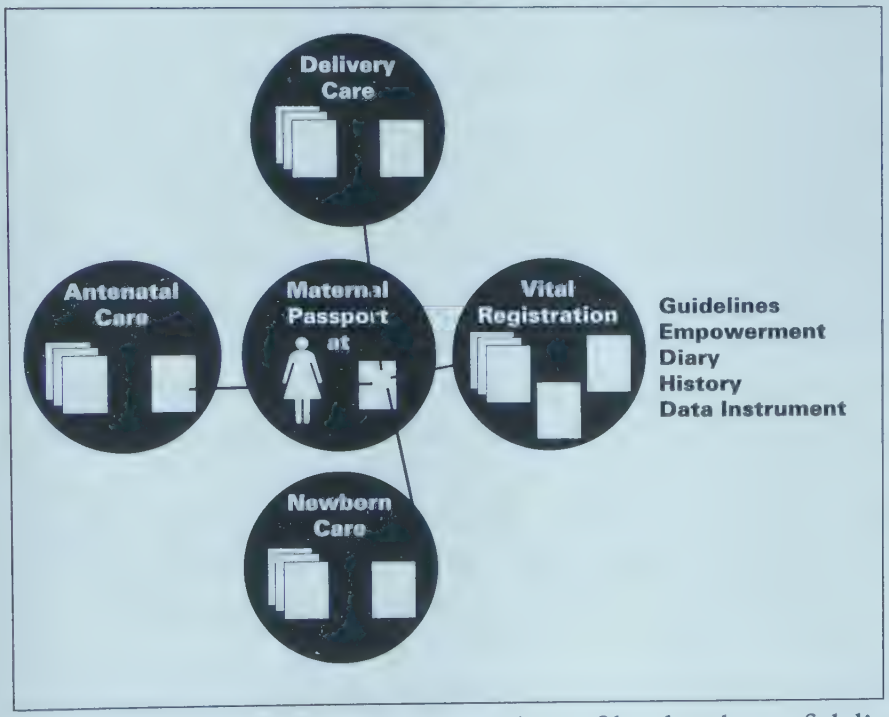
Given that these deaths most often happen at home, it is essential to collect data from the community. Hospital-based surveys significantly underestimate the problem and are not able to capture many of the barriers to care that occur outside of the health institution. Maternal and neonatal deaths are not solely a medical problem, and so it is important to collect data from many different perspectives to be able to identify barriers to maternal health services. Both quantitative and qualitative data can be collected in the community as well as in health institutions.

There are numerous methods for regular collection of quantitative data about outcomes for the mother and the baby. However, the most suitable for low-resource settings are:

- a home-based maternal record/newborn record;
- a community-monitoring board;
- birth registers in institutions/health centers; and
- verbal autopsies and case reviews.

Quantitative data can be collected with various tools at the health institution. This approach is more appropriate to one or two stages of the management cycle than to ongoing surveillance tools. This is due to the selection bias that is usually associated with institutional-based systems.

FIGURE 2.19
THE MATERNAL RECORD

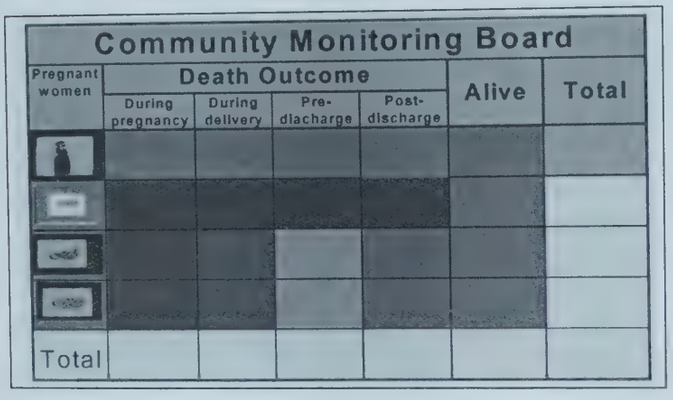


The Home-based maternal/newborn record (the "maternal passport") has been supported by WHO. It is a home-based, maternal/newborn, 1- to 2-page record that the mother keeps. Each time she has contact with the HCDS her progress is updated (i.e., results of screening tests, problem lists, and treatment records during the course of pregnancy, labor, delivery, and the postpartum period). A copy of this record may be maintained at the local health facility and can serve as the means for data collection. The essential newborn data to be collected are birth weight, sex, date of birth, place of delivery, mode of delivery, attendant, gestational age (if known), plurality, residence, breastfeeding-at-7-days, and age-at-death for a live birth, or for a fetal death whether the stillbirth was macerated or fresh (Table 2.6). The essential maternal data include maternal age, obstetrical history, medical complications, treatments received during pregnancy, and family planning methods.

The importance of this record should not be underestimated. Continuous communication and feedback between the various levels of care are needed to ensure that the health system response is appropriate and of sufficient quality. Performance of regular case reviews of maternal, fetal, and neonatal deaths and "near misses" is an effective means of identifying substandard care and avoidable factors. Institution of a home-based maternal record is an effective means of achieving better client management. The home-based maternal care record can serve five main functions (Figure 2.19) to:

- communicate the essential care practices and serve as a guideline for care providers;
- empower the mother and her spouse, family, and community to expect a standard of care from the HCDS;
- serve as a clinical record (enabling communication between providers at various levels of care) and to monitor progress during pregnancy, childbirth, and the postpartum period;
- serve as a historical document for future reference and care; and
- serve as a data collection instrument for the HMIS in monitoring and evaluating maternal and perinatal services.

FIGURE 2.20
THE COMMUNITY MONITORING BOARD USED IN RURAL TANZANIA



The community monitoring board is a means of tracking every pregnancy and its outcome in the village (Figure 2.20). The rows represent the different birth weight groups of the newborn. For each pregnant woman, a pin that is first located in the upper left green cell will be moved to the appropriate cell upon delivery. The columns stand for the status (alive or dead) of the mother and newborn. In Tanzania, the board has also been used as a visual representation of the BABIES matrix, which is more fully described in the next chapter. Community leaders can assess their situation by reviewing where the pins are placed on their board and can act according to the intervention cells on the board.

Birth registers (delivery room logs) are kept in most institutions in which deliveries occur as either a birth register or delivery room log. The delivery room log is a line listing of every event that takes place in the delivery room. An untapped wealth of data on births and deaths is kept in these delivery room logs, but these data often go unnoticed and, consequently, underutilized. Variables such as maternal age, parity, residence, medical conditions, mode of delivery, attendant, length of labor, birth weight, and sex of the newborn, as well as outcome for both the mother and newborn, are included in the delivery room log.

The delivery room log tick table is an appropriate technology for low resource settings. Data processing and analysis are greatly facilitated by the computer, but the lack of a computer should not prevent relatively sophisticated analysis of the delivery room log[11].

Figure 2.21 is a typical delivery room log. Figure 2.22 is a representation of a typical, but abbreviated delivery room log line listing (the columns have been narrowed to simplify illustration). The rows of the delivery room log correspond to data from one woman, and the average number of women per double page is 20. Traditionally, the delivery room head midwife hand tallies the data with simple frequencies by making several passes through the pages of the delivery room log. The numbers of C-sections, LBW babies (expressed as percentages), and maternal deaths, stillbirths, and pre-discharge neonatal deaths are common elements in the monthly report. The other data in the delivery room log may be used to manage the patient, but usually goes unused for programmatic purposes.

FIGURE 2.21
PICTURE OF A DELIVERY ROOM LOG BOOK

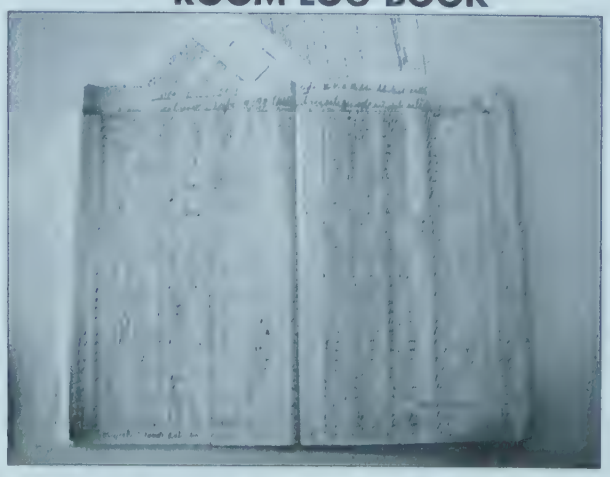


FIGURE 2.22
ABBREVIATED LINE LISTING OF DELIVERY ROOM LOG BOOK

# Ser.	RC#		Age (Yr)	Gravidity	Parity		BthInterval	GA @ Reg	# Antenatal Visits		Method of delivery	Place of delivery	Type of delivery		Risk @ Registration	Risk status@ Delivery		Hgb < 9		Outcome	Birthweight	Sex	Age at death	Cause of death	
D																									

Consider an alternative method that uses a "tick table." A tick table is a multi-dimensional table containing 2 to 6 variables in which each combination of all of the variables has one cell. For example, a table with 2 variables and 2 values for each variable will have 4 (2x2) cells. A table with 3 variables and 2 values for each variable will have 8 (2x2x2) cells. For each person in a line listing with the variables there is one cell that describes all combinations of the values of each variable. Health personnel using tick tables simply proceed through the table in an orderly fashion that brings them to the cell that describes a person in the line listing with each value of the variable. A tick is placed in the cell or a dot filled for every person with those values.

Figure 2.23 is an example of a tick table used by health personnel in Africa. The core table is the outcome of the mother and baby (columns) and the birth weight group of the baby (rows). In the next section, this core table is defined as BABIES. In Figure 2.23, the mother and baby are classified according to complications at delivery (defined locally but might include prolonged labor, pre-eclampsia and eclampsia, diabetes, hemorrhage, etc.), the attendant of the delivery (physician or midwife), and the mode of delivery (vaginal or c-section). Instead of several passes through the delivery room log book to count the frequency of one variable, the midwife makes only one pass. The midwife performs the following tasks for each line (woman).

FIGURE 2.23
DELIVERY ROOM LOG TICK TABLE

Delivery Room Log Tick Table

Labor Complications, Attendant at delivery, Type of delivery, Birthweight group				Mother			Baby					
								Stillbirth		Neonatal Death		
				Alive	Dead	Total	Alive	Late Fetal	Intra Partum	Early NND < 7 days	Late NND 7- <28 days	Total
Labor complications	Physician	Vaginal	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo ooooooooooo	oo		ooooooooooo ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
		C-sec	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
	Midwife	Vaginal	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
		C-sec	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
No complications	Physician	Vaginal	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo ooooooooooo	oo		ooooooooooo ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
		C-sec	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
	Midwife	Vaginal	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
		C-sec	<1500	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			1500-2499	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			2500-3999	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
			4000+	ooooooooooo	oo		ooooooooooo	oo	oo	oo	oo	
Column Total												

Task 1 Task 2 Task 3 Task 4 Task 5 Task 6 Task 7

- **Task 1.** She determines if the mother experienced a complication(s), a condition(s) previously defined according to the available delivery room log book data. She chooses the appropriate group of rows.
- **Task 2.** She determines who delivered the mother and baby and chooses the appropriate group of rows.
- **Task 3.** She determines the type of delivery (vaginal or C-section) and chooses the appropriate group of rows.
- **Task 4.** She determines the birth weight of the baby and chooses the corresponding row in which the value falls.
- **Task 5.** She places a tick in the circle of the appropriate outcome column for the mother.
- **Task 6.** She places a tick in the circle of the appropriate outcome column for the baby.
- **Task 7.** She adds the columns and rows of the table.

Upon completion of this monthly task the midwife has a table that provides her with the traditional frequencies in the monthly report. She can provide:

- the percent of births to women with labor complications;
- the percent of births covered by a physician;
- the c-section rate;
- the low birth weight rate;
- the fetal and neonatal mortality rates; and
- the number of maternal deaths.

These are all proportions that are available from the frequency counts taken from the delivery room log book.

In Section IV, the manual presents BABIES, the core table in this example. The same data will produce much more information because of the way it has been organized with BABIES.

Verbal autopsies and case reviews can be done in the institutions or in the community. Because most maternal and newborn deaths occur at home, this type of approach is very important for delving into issues related to the delays in obtaining medical care, such as identifying the problem, deciding to seek care, and obtaining transportation.

SUMMARY
BUILDING AN HMIS

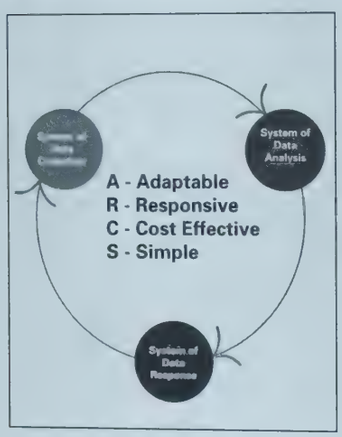
Information is a powerful weapon to reduce disparity in maternal and newborn health outcomes.

Data translated into information can raise a "red flag" signalling areas that may require further investigation or action.

An HMIS is a dynamic system that can be used to collect, analyze, and respond to data about the occurrence and distribution of outcomes for a population within a given geographical location.



Every pregnancy counts.....so account for every pregnancy.
Every newborn counts and has weight...so account for and weigh every newborn.



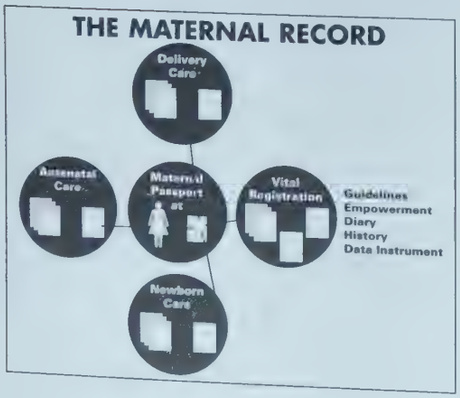
An HMIS should be adaptable, responsive, cost-effective, and simple to operate. Each level of the HCDS has a responsibility in the operation of the system and should be able to use the data it collects to make level-appropriate decisions.

An HMIS has three parts: data collection, data analysis, and data response. When it is functioning, the system operates in a clockwise fashion. When designing, a counterclockwise process should be used.

The important questions that need to be asked when designing the system are grouped according to the three HMIS components.

1. **HMIS Action 1: Data response:** To which differences will the program manager respond? What decisions have to be taken regarding these differences? What information will help in these decisions? What questions need to be answered before a response can be made?

2. **HMIS Action 2: Data analysis:** What type of analysis is needed to provide the information necessary to make the decision?



3. **HMIS Action 3: Data collection:** What are the minimum data and the simplest way to collect these data that are needed to obtain the required information?

The maternal record is a core element in the system. It serves as a guideline for what is supposed to happen, an empowerment tool for the mother to know and demand what should happen, a diary of the current pregnancy, a history recorder for the future, and a data collection tool for surveillance.

IV. THE BIRTH WEIGHT AND AGE-AT-DEATH BOXES FOR AN INTERVENTION AND EVALUATION SYSTEM MATRIX

FIGURE 2.24
BABIES MATRIX

B BIRTH WEIGHT GROUP &
A AGE AT DEATH
B BOXES for an
I INTERVENTION &
E EVALUATION
S SYSTEM



BABIES Matrix is an adaptable assessment tool that allows the program manager to collect, organize, analyze, and translate data into information for newborn health intervention. It combines two pieces of data:

- age at the time of death of the fetus/newborn
- birth weight group

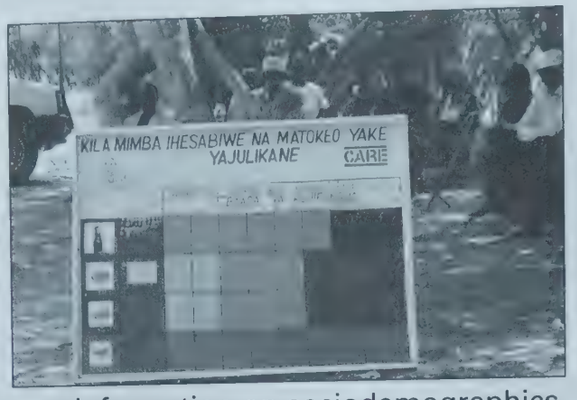
BABIES is a simple system to define the newborn health problem, assess the performance of the HCDS, select effective interventions, and perform monitoring and evaluation.

A. Uses of the BABIES Matrix

The BABIES Matrix can be used for tracking all pregnancies at levels of the health care delivery system ranging from the village to peripheral health institutions and hospitals. At the district or regional level, BABIES can help the program manager to identify "Opportunity Gaps in their setting. These "gaps" are identified by making comparisons by time, place, and person. These comparisons enable managers to make important decisions regarding policy, the choice of interventions, training, and resource allocations (Panel 2.1).

PANEL 2.1
LESSON LEARNED

COMMUNITY MONITORING BOARD AS A TOOL TO PRIORITIZE INTERVENTIONS



As part of a CARE's community-based reproductive health project in rural Tanzania, a Maternal and Perinatal Health Care Surveillance System was established to monitor pregnancy outcomes. Village health workers were trained to collect data during health education visits to pregnant and postpartum women. Information on sociodemographics, medical history, delivery characteristics, and pregnancy outcome was collected. Maternal and fetal/infant survival or deaths were tracked on a community monitoring board, organized by birth weight and age-at-death, and grouped according to underlying causes and associated potential interventions. Among 904 pregnancies, the fetal-neonatal mortality rate was 69.4 deaths per 1,000 total births. There were four maternal deaths. The low birth weight rate was 19 percent. Intrapartum and early neonatal deaths with birth weights less than 1,500 grams represented a large proportion of deaths, most of which occurred among deliveries at home or at dispensaries, the most basic level of care.

These preliminary results will be used to prioritize project interventions, including increasing access to skilled delivery care. Ongoing data collection will provide outcome indicators for project evaluation.

Source: Unpublished data, CARE/CDC Health Initiative Project in Mwanza, Tanzania (2000)

B. Concepts for Understanding BABIES

Five concepts are listed in Table 2.7 and discussed in this section to help the program manager understand and use the BABIES tool more effectively.

TABLE 2.7
BABIES CONCEPTS

Concept 1	Time: age at death of fetus /neonate
Concept 2	Birth-weight group or birth size of fetus /neonate
Concept 3	Think in two dimensions – the birth weight and time at death matrix
Concept 4	Interpreting the cells in BABIES and grouping them into intervention packages
Concept 5	The Opportunity Gap

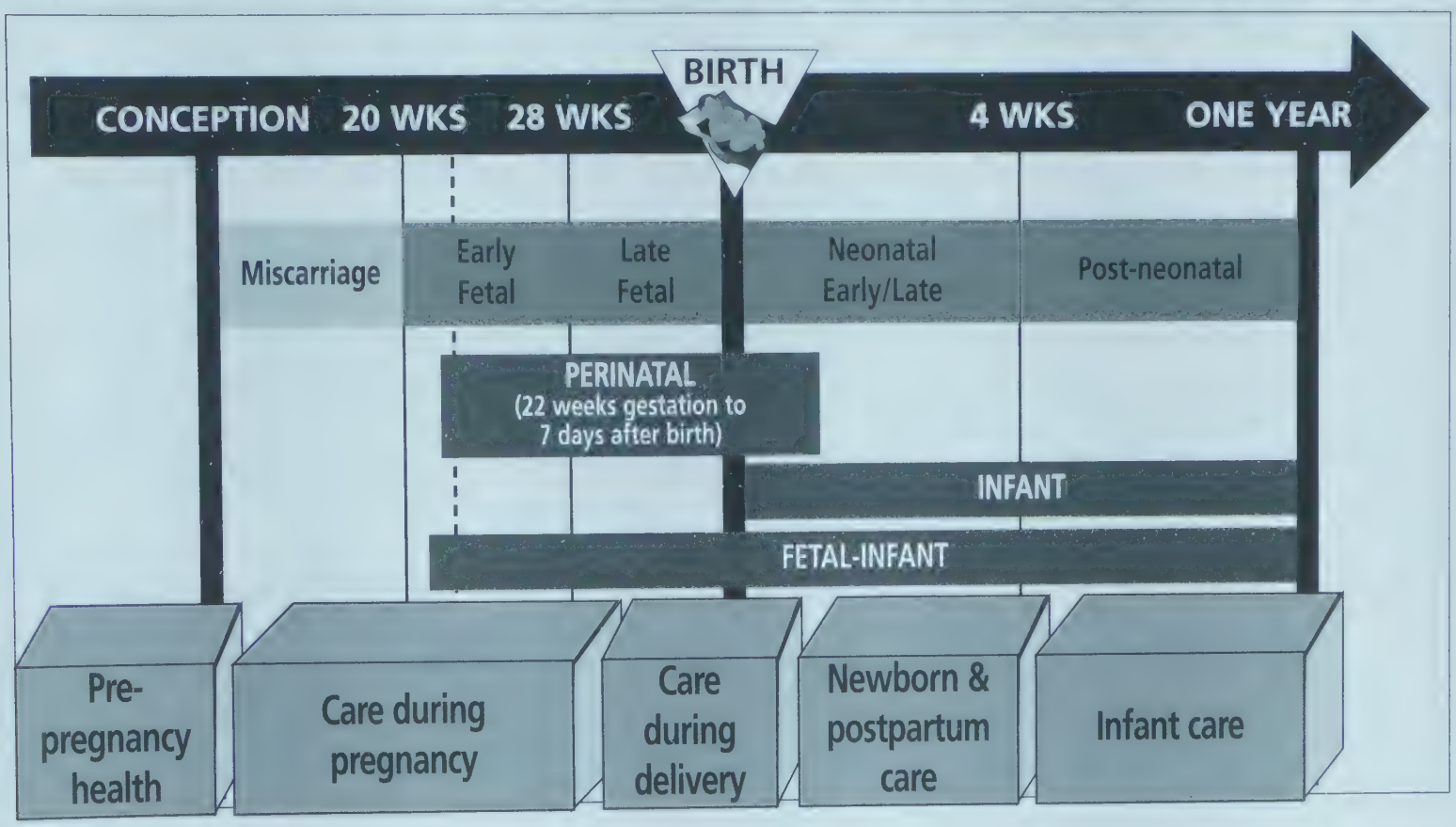
CONCEPT 1: Time (age at death of fetus/neonate)

Traditionally, program managers have thought in one dimension, time. Maternal and newborn programs have focused on providing interventions based on their effect during specific periods (Figure 2.25). Key periods when interventions are packaged together to have a major impact on the health of the mother and newborn include:

- pre-pregnancy;
- during pregnancy;
- during delivery;
- postpartum/newborn period; and
- infancy.

Time periods form the columns in the BABIES matrix and can be used for both mother and baby death events.

FIGURE 2.25
INTERVENTION PACKAGE FOR TIME PERIODS OF PREGNANCY, NEONATAL AND INFANT LIFE



CONCEPT 2. Birth-Weight Group or Birth Size

Birth weight is one of the best predictors of neonatal survival. The distribution of birth weight within a given population is often a reflection of the general health status of pregnant women. A healthy mother is the first requirement for a healthy newborn. The growth of the fetus, as measured by birth weight, is primarily related to maternal factors such as age, parity and spacing of pregnancies, nutrition, infections, and workload. Strategies for improving outcomes for the baby can be divided into two categories: those aimed at altering birth weight distribution and those aimed at improving the survival of babies already born. The suggested birth weight groups for BABIES are those which correspond to the level of technology required to substantially improve the chance of neonatal survival. Very low birth-weight (VLBW, 0-1,499 grams) newborns require a high level of expensive technology, usually far above the capacity of developing countries. The intermediate birth weight (IBW, 1,500-2,499 grams) newborn requires a moderate level of technology, mostly associated with temperature control, feeding, and treatment for infections. The normal birth weight (NBW, ≥2,500 grams) newborn requires the least technology and benefits most from a skilled attendant who makes the proper decisions.

CONCEPT 3. Think in Two Dimensions - The Time and Birth Weight Matrix

The BABIES matrix is created by cross-tabulating age of death categories (columns) and birth weight groups (rows) to form a matrix. The simplest cross-tabulation has two columns and two rows. As in the Count-Divide-Compare (C-D-C) cycle, the cells contain the absolute count of deaths. In many settings, the quantity and the quality of data are incomplete and poor. The tool, however, is flexible. Even if crude birth weight groups are used, they will provide useful information for decision-making . For example, in a setting where most newborns are not weighed, their relative size (small versus normal) may be used for the rows (the title of the rows in the matrix in Table 2.8). The setting allows one to distinguish between stillbirths (deaths before or during labor) and live births (deaths after labor and delivery). At the village or institutional level, the absolute count of deaths organized in this way provides a wealth of information.

As discussed in Figure 2.12, a simple 2x2 table can be used to organize the data as presented in Table 2.8. If the data are available, the rows and columns can be refined to include smaller groupings of birth weight and age at death. In this manual, a basic 12-cell matrix is used (Figure 2.24). In more developed settings, the rows can be divided further to include less than 1000 grams and 4000+ grams groups. In institutional settings, the time periods are frequently divided into hours and days. This flexibility is one of the advantages of the BABIES matrix.

TABLE 2.8
READING THE BABIES MATRIX

BIRTH WEIGHT GROUP	STILLBIRTHS (deaths before or during labor)	DEATHS TO LIVE BIRTHS (up to specified age)
Small	Cell 1 If a death is placed in this cell, the baby is in the small birth-weight group **AND** was a stillbirth.	Cell 2 If a death is placed in this cell, the baby is in the small birth-weight group **AND** was born alive but died before a given age.
Normal	Cell 3 If a death is placed in this cell, the baby is in the normal birth-weight group **AND** was a stillbirth.	Cell 4 If a death is placed in this cell, the baby is in the normal birth-weight group **AND** was born alive but died before a given age.

In Figure 2.24, there are four time periods that will be used for age at death.

1. **During pregnancy:** 28 weeks gestation until the onset of labor.
2. **During delivery:** from the onset of labor to birth.
3. **Pre-discharge:** In a health institution, this is the time before the newborn leaves the facility. In the home, this is the time before the attendant leaves the home.
4. **Post-discharge:** from discharge to the 28th day of life.

There are three birth-weight group:

1. **Very low birth weight (VLBW):** (less than 1,500 grams).
2. **Intermediate birth weight (IBW):** (1,500-2,499 grams).
3. **Normal birth weight (NBW):** (at least 2,500 grams).

FIGURE 2.26
THE 12-CELL BABIES MATRIX



Since there are four values for age at death and three values for birth weight group, the cross-tabulation of age at death and birth weight group has 12 (3x4) cells in the table.

At the village or institutional level, the deaths are counts. Each death (count) is plotted in the appropriate cell. A cluster of deaths in a particular cell is a visual representation of a problem in a particular birth weight group and time period. Villagers or staff members react to the cluster. In settings where only the 12 cells were used as a community monitoring board, the visual reminder was a "death" table and viewed as a negative reminder. In order to put a more positive perspective on the board, the villagers using the community monitoring board in Tanzania added another column for the "alive" mothers and infants (Panel 2.1).

The addition of the "alive" column actually facilitates the next step in the C-D-C cycle. In order to divide, the cells in the rows and columns are added to produce the totals of the matrix. The totals of the rows and columns are the denominators to calculate rates, ratios, and proportions. A cell, or group of cells, divided by a total (either row total or column total) produces a rate or proportion that can be used as an indicator. The program manager uses the indicators derived from the BABIES matrix to make comparisons for monitoring and evaluation. This information derived from the comparisons allows the program manager to make important decisions or answer key questions about the program.

FIGURE 2.27
BABIES MATRIX
COUNT-DIVIDE-COMPARE

	During Pregnancy	During Delivery	Predischarge	Post Discharge	Alive	Total
≤1,499g	1	2	3	4	17	18
1,500-2,499g	5	6	7	8	19	20
≥2,500g	9	10	11	12	21	22
Total	13	14	15	16	23	24

In Figure 2.7, cells 17, 19, and 21 contain the total number of newborns who are alive (survivors) at 28 days. Cells 18, 20, and 22 are the row totals for the respective birth weight groups, both deaths and live newborn. Cells 13,14,15, and 16 are the column totals for the number of deaths in each period. Cell 24 is the total number of events (stillbirths plus live births). Different rates with various uses will be described. later in this section These rates, their use, and interpretation will vary primarily according to which cell is used as the denominator. Cell 24 will be used most frequently as the denominator, but cells 18, 20, and 22 also have important uses as denominators. The column totals, cells 13 through 16, are the most frequently used cells used in the numerator when calculating the traditional mortality rates.

To fully utilize the BABIES matrix, the program managers should make a sincere effort to know the outcome of every pregnancy (total births). At the village level, and definitely at the institutional level, this is not as difficult as one imagines. The community monitoring board and genuine community participation greatly facilitates this task.

CONCEPT 4. Intrepreting the Cells in BABIES and Grouping Them into Intervention Packages

Table 2.9 helps to interpret each of the cells in the BABIES matrix. Examples of the common causes of death are given in each of the cells in the second column.

FIGURE 2.28
GROUPING THE CELLS IN BABIES BY INTERVENTION PACKAGE



On the basis of knowledge of the intervention packages, the cells can be grouped into major intervention categories. In Figure 2.28, the grouped cells are color-coded into the four generic categories: the third column in Table 2.9 names the Intervention Package. These intervention packages will be described in greater detail in Part Four including:

- Pre-pregnancy health (blue cells, cells 1 to 4);
- Care during pregnancy (red cells, cells 5 and 9);
- Care during delivery (dark red cells, cells 6 and 10);
- Pre-discharge care (green cells, cells 7 and 11); and
- Post-discharge care (magenta cells 8 and 12).

TABLE 2.9
INTERPRETING THE BABIES TOOL

CELL	WHAT THE CELL MEANS	EXAMPLES OF COMMON CAUSES OF DEATH FOR THIS CELL	INTERVENTION PACKAGE
1	Deaths (stillbirths) before the onset of labor among babies weighing less than 1,500 grams.	Maternal infection and other causes of preterm labor. Severe antepartum hemorrhage. Hypertensive disease in pregnancy. Maternal syphilis.	Pre-pregnancy health
2	Deaths (stillbirths) during labor among babies weighing less than 1,500 grams.	Maternal infection and other causes of preterm labor. Severe antepartum hemorrhage. Hypertensive disease in pregnancy.	Pre-pregnancy health
3	Deaths among live births before they are discharged from the health institution[1] among babies weighing less than 1,500 grams.	Complications of prematurity, such as surfactant deficiency, asphyxia, jaundice, and infection.	Pre-pregnancy health and high-tech neonatal care
4	Deaths among live births after they are discharged from the health institution among babies weighing less than 1,500 grams.	Later complications of prematurity, such as infections, feeding failure, jaundice.	Pre-pregnancy health and simple newborn care
5	Deaths (stillbirths) before the onset of labor among babies weighing between 1,500-2,499 grams (macerated stillbirth).	Maternal syphilis and other sexually transmitted infections (STIs). Hypertensive disease in pregnancy.	Care during pregnancy
6	Deaths (stillbirths) during labor among babies weighing between 1,500-2,499 grams (fresh stillbirth).	Asphyxia due to intrapartum obstetric emergency.	Care during delivery
7	Deaths among live births before they are discharged from the health institution among babies weighing between 1,500-2,499 grams.	Complications of prematurity and intrauterine growth restriction (IUGR), including infections, asphyxia, jaundice, hypothermia, hypoglycemia. Severe birth defects.	Newborn care
8	Deaths among live births after they are discharged from the institution among babies weighing between 1,500-2,499 grams.	Neonatal sepsis, neonatal tetanus, jaundice. Birth defects.	Newborn care
9	Deaths (stillbirths) before labor among babies weighing more than 2,500 grams (macerated stillbirth).	Maternal syphilis and other STIs. Hypertensive disease in pregnancy, malaria.	Care during pregnancy
10	Deaths (stillbirths) during labor among babies weighing more than 2,500 grams (fresh stillbirth).	Asphyxia due to intrapartum obstetric emergency.	Care during delivery
11	Deaths among live births before they are discharged from the health institution among babies weighing more than 2,500 grams.	Asphyxia and birth trauma. Infections, especially sepsis. Jaundice. Severe birth defects.	Newborn care
12	Deaths among live births after they are discharged from the health institution among babies weighing more than 2,500 grams.	Infections, especially sepsis, tetanus. Jaundice. Birth defects.	Newborn care

[1] If the baby was not born in an institution, this column can be interpreted to mean until the skilled attendant leaves the home. If most deliveries are unattended, the matrix can be adapted. For example, use age (first 24 hours or first week) for this column.

Pre-pregnancy health(cells 1 to 4): Excessive numbers of newborn deaths recorded in cells 1 through 4 reflect the health of the mother (Table 2.9). Most babies with birth weight less than l,500 grams are preterm with intrauterine growth retardation (IUGR). Both prematurity and IUGR are related to the health status of the mother, primarily to nutrition, infections, high parity, or pregnancy at a young age as described in Part One. Cells 1 and 2 record babies who weigh less than 1,500 grams and are stillborn. This outcome may be due to any cause of preterm birth, including infections, such as malaria or bacterial vaginosis, or obstetric emergencies, such as antepartum hemorrhage or cervical incompetence. Therefore, the interventions that may be the most effective in improving outcome are primarily targeted at the mother. These include:

- family planning;
- assessment, referral, and treatment for pre-existing medical conditions (i.e., hypertension, diabetes, malaria);
- improving nutrition/micronutrients/ maternal energy conservation;
- preventing, identifying, and treating infections especially STIs in the 1st and 2nd trimester; and
- avoidance of substance abuse, such as smoking, alcohol, and other drugs.

Care during pregnancy (cells 5 and 9): These deaths are usually macerated stillbirths. Recording an excessive number of fetal deaths among neonates weighing greater than or equal to 1,500 grams occurring in cells 5 and 9 reflects the health of the mother during the pregnancy period (not including early abortions). Fetal deaths occurring before the onset of labor reflect poor care during pregnancy and are most often due to maternal syphilis or diabetes. The difference between a macerated and fresh stillbirth indicates whether the late trimester care was less than optimal (macerated stillbirth) or whether the labor and delivery services needed improvement (fresh stillbirth). Major interventions during this period include:

- adequate quality of antenatal care, including complications of pregnancy such as antepartum hemorrhage, gestational diabetes, and hypertensive disorders of pregnancy;
- improved nutrition during pregnancy including micronutrients;
- addressing anemia in pregnancy, including malaria treatment were appropriate;
- prevention, identification, and treatment of infections, especially STIs; and
- birth planning for all women, especially those who are HIV positive.

Care during delivery (cells 6 and 10): Recording an excessive number of fetal-newborn deaths among neonates weighing greater than or equal to 1,500 g in cells 6 and 10 reflects the care of the mother during labor and delivery. These deaths are the best indicator of a poorly functioning emergency obstetric care system and may mirror "near misses" of maternal deaths. The primary interventions in this situation include:

- good coverage with skilled attendant at birth;
- adequate quality of emergency obstetric care services (surgical and medical services to treat sepsis, eclampsia, hemorrhage, obstructed labor);
- adequate quality of immediate newborn services (resuscitation); and
- functioning transportation and communication systems to reduce delays in access to care for the mother /newborn.

Pre-discharge: early newborn care (cells 7 and 11): An excessive number of early deaths among neonates weighing greater than or equal to 1,500 g reflects the system's institutional capacity to care for the newborn. Deaths recorded in these cells are often due to an inability to resuscitate the newborn, maintain thermal control, or treat infections. These are easier to prevent with a moderate level of technology. Deaths recorded in these cells usually occur in the health institution from one hour after delivery until 2 -3 days of life. Interventions include:

- extra newborn care to prevent complications;
- adequate quality of newborn resuscitation;
- medical services to treat sepsis, asphyxia, jaundice, and metabolic conditions; and
- functioning transportation and communication systems to reduce delays in access.

Post-discharge: late newborn care (cells 8 and 12): An excessive number of later deaths among neonates weighing greater than or equal to 1,500 g reflects the care of healthy newborns after they leave the health institutions. Deaths in the time period of 4 to 12 days of life should alert the program manager to cases of neonatal tetanus or neonatal sepsis, which may be related to cord care practices. If the newborn is not exclusively breastfed, the excessive deaths may be due to diarrhea after exposure to unsafe water in the formula. If the newborn is exclusively breastfed, acute respiratory infection may be the primary cause of death. Gender-specific differences in these cells also provide an early warning of preferential care being given to one gender.

The outcome indicators derived from BABIES can and should be linked to indicators associated with intervention packages. Each group of cells has an evidenced-based package that, if implemented, should reduce deaths in those cells. The interventions within the package have an "impact" indicator that provides information about the intervention. For example, in Figure 2.28, if an excessive number of deaths are recorded in the blue cells (pre-pregnancy health), the impact of contraceptive prevalence, anemia rate, and smoking rate are important indicators to monitor.

CONCEPT 5. The "Opportunity Gap"

This completes the Count-Divide-Compare cycle. The comparison of rates (mortality and/or morbidity) between a selected standard population and the local population defines a "gap"in health status. If the selected population has achieved a better health status than the local population, this comparison provides an opportunity for the local population to improve their health status. There is an "opportunity" to achieve fairness between populations by improving the availability, accessibility, acceptability, affordability, and the appropriateness (the Five As) of services to marginalized groups in order to reduce the "gap." In many situations, a large portion of the "Opportunity Gap" may be concentrated in one subpopulation (i.e., LBW babies, adolescent mothers) or with one specific cause (i.e., infection). One overall objective of the program is to reduce the "Opportunity Gap."

PANEL 2.2
LESSON LEARNED

THE "OPPORTUNITY GAP" STEP-BY-STEP USING BABIES IN CALI, COLOMBIA

From 1997-2001, health officials in Cali, Colombia, collected data on fetal and neonatal deaths from the University Hospital, the only public, tertiary level hospital in the city. Because the data were collected at the institutional level, only newborn deaths occurring before discharge from the hospital were captured.

TABLE 2.10a
MORTALITY AND EVENT DATA FOR THE REMAINING POPULATION (EXCLUDING THE STANDARD POPOULATION)BY AGE AT DEATH AND BIRTH WEIGHT GROUP

	CARE DURING PREGNANCY	CARE DURING DELIVERY	NEWBORN CARE	ALIVE	TOTAL
≤1500	193	55	53	801	1102
1500-2499	116	26	18	4898	5058
≥2500	149	46	27	22645	22867
Total	458	127	98	28344	29027

Task 1: The raw data were plotted into the BABIES matrix for the population of interest, and excluded the standard population from Cali to be used in calculating the "Opportunity Gap" (Table 2.10.a). The age at death categories corresponded to the time of the intervention package: care during pregnancy, care during delivery, and newborn care prior to discharge. Birth weight was divided into three categories: ≤1,500 g, 1,500-2,499 g, and ≥ 2,500 g, Babies alive at discharge were included in the matrix.

TABLE 2.10b
BIRTH WEIGHT PROPORTIONATE MORTALITY RATES (EXCLUDING STANDARD POPULATION) AGE AT DEATH AND BIRTH WEIGHT GROUP

	CARE DURING PREGNANCY	CARE DURING DELIVERY	NEWBORN CARE	TOTAL
≤1500	6.6	1.9	1.8	10.4
1500-2499	4.0	0.9	0.6	5.5
≥2500	5.1	1.6	0.9	7.6
Total	15.8	4.4	3.4	23.5

Task 2: With the plotted data in the BABIES matrix, birth weight proportionate mortality rates were calculated for the population (Table 2.10.b). To calculate this rate, the number in each cell was divided by the total number of events (29,027) and multiplied by 1,000. For example, the rate for death care during pregnancy for less than 1500g weight group was 6.6 per 100 (193/29027 x 1000). After converting the raw data, the rates were plotted in the BABIES matrix.

PANEL 2.2
LESSON LEARNED

THE "OPPORTUNITY GAP" STEP-BY-STEP USING BABIES IN CALI, COLOMBIA (CONT.)

TABLE 2.10c
BIRTH WEIGHT PROPORTIONATE MORTALITY RATES (LOCAL STANDARD) BY AGE AT DEATH AND BIRTH WEIGHT GROUP

	CARE DURING PREGNANCY	CARE DURING DELIVERY	NEWBORN CARE	TOTAL
≤1500	2.0	1.0	0.0	3.0
1500-2499	3.0	0.0	0.0	3.0
≥2500	5.0	1.5	0.5	7.0
Total	10.0	2.5	0.5	13.0

Task 3: Officials in Cali chose a local group as the standard to calculate the Opportunity Gap. This standard consisted of women who were <35 years of age, literate, with no previous pregnancies, and more than three prenatal visits. The raw data for the standard group were plotted into the BABIES matrix and then converted into birth weight proportionate mortality rates (Table 2.10c).

TABLE 2.10d
BIRTH WEIGHT PROPORTIONATE MORTALITY RATES BY INTERVENTION PACKAGE

<table>
<tr><td></td><td colspan="3">Local Population</td></tr>
<tr><td>≤1500</td><td colspan="3">10.3 (6.6+1.9+1.8=10.3)</td></tr>
<tr><td>1500-2499</td><td rowspan="2">9.1</td><td rowspan="2">2.5</td><td rowspan="2">1.5</td></tr>
<tr><td>≥2500</td></tr>
<tr><td></td><td colspan="3">Standard</td></tr>
<tr><td>≤1500</td><td colspan="3">3.0</td></tr>
<tr><td>1500-2499</td><td rowspan="2">8.0</td><td rowspan="2">1.5</td><td rowspan="2">0.5</td></tr>
<tr><td>≥2500</td></tr>
<tr><td></td><td colspan="3">"Opportunity gaps"</td></tr>
<tr><td>≤1500</td><td colspan="3">7.3 (10.3-3.0=7.3)</td></tr>
<tr><td>1500-2499</td><td rowspan="2">1.1</td><td rowspan="2">1.0</td><td rowspan="2">1.0</td></tr>
<tr><td>≥2500</td></tr>
</table>

Task 4: Before assessing the "Opportunity Gap", the birth weight proportionate mortality rate for each intervention package was calculated. For example, to obtain the sample mortality rate for the Pre-Pregnancy Health intervention package, the three rates within the less than 1500g group were added (6.6+1.9+1.8=10.3). This process was performed on the local data and local standard for each intervention package. Using these matrices, officials in Cali calculated the "Opportunity Gap" for each intervention package (pre-pregnancy, care during pregnancy, care during delivery, newborn care) by subtracting the standard rates from the sample rates (Table 2.10d). For example, the gap in the pre-pregnancy health rate was 7.3 (10.3-3.0=7.3). This finding indicated that the package with the greatest potential for the reduction in fetal and newborn mortality was the Pre-Pregnancy Health package. Consequently, the Columbian health officials decided to concentrate their public health efforts there.

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C. Using BABIES to Program for Newborn Health

Program managers can adapt the actions to implement the BABIES matrix to fit their situation (Table 2.11). Each of these actions is briefly described in this section. Examples, lessons from the field, and reference tables are used to clarify some of the actions.

TABLE 2.11
ACTIONS FOR IMPLEMENTING THE BABIES MATRIX

Action 1	Review data and adapt the matrix to the program setting.
Action 2	Plot the data into the matrix.
Action 3	Convert raw data into rates.
Action 4	Calculate the "Opportunity Gap."
Action 5	Analyze the "Opportunity Gap" by time, person, place.
Action 6	Choose the cell or group of cells upon which to focus.
Action 7	Assess performance with regard to the chosen focus cell.
Action 8	Choose the intervention strategy and establish goals and objectives.
Action 9	Select outcome and process indicators for your program and develop HMIS.
Action 10	Repeat the cycle to achieve continuous improvement.

BABIES ACTION 1. Review Data and Adapt the Matrix to the Program Setting

The basic 12-cell table is well-suited for village use. The choice of rows (birth weight groups) and columns (age at death) is very flexible. The rows can be adapted to emphasize big babies or small babies, depending on where mortality is the biggest problem. The choice of columns for a given setting depends on two factors:

- where the deliveries take place (mainly at home or in institutions); and
- how much follow-up care is feasible.

Home deliveries may provide an opportunity for longer follow-up periods because the village health worker may be more available. Because institutional deliveries may have short stays and little follow-up, the time column may need to be divided into hours rather than days. After the BABIES matrix is created (selecting the rows and columns on the basis of the data available), the data can be plotted in the cells.

BABIES ACTION 2. Plot the Data Into the Matrix

Plot the data from the village, health center, and hospital in the BABIES matrix. The deaths are placed in the appropriate cells. The delivery room log is an untapped data source that often has a line listing for every delivery and usually contains many of the personal characteristics that help define subpopulations for describing the "Opportunity Gap". In a matter of hours, institutions with thousands of births per year can construct the BABIES matrix, even adapting the columns for more specific time periods or sorting the populations to compare each BABIES matrix.

The BABIES matrix provides a better understanding of both the population the institution serves and how well the institution performs. Table 2.12 provides an example of what the raw data (deaths) might look like from a district hospital. A case review of the deaths provides additional data for the development of the intervention strategy. The review should start with all maternal deaths and all deaths among normal-size babies.

TABLE 2.12
BABIES: AN EXAMPLE USING RAW NUMBERS

BIRTH WEIGHT GROUPS	DURING PREGNANCY	DURING DELIVERY	PRE-DISCHARGE	POST - DISCHARGE
<1,500 g	**14** *Cell 1*	**12** *Cell 2*	**24** *Cell 3*	**11** *Cell 4*
1,500-2,499 g	**11** *Cell 5*	**9** *Cell 6*	**41** *Cell 7*	**22** *Cell 8*
>2,500 g	**38** *Cell 9*	**30** *Cell 10*	**39** *Cell 11*	**8** *Cell 12*

The following information can be derived from Table 2.12.

- Cell 9 contains numerous macerated stillbirths, suggesting the presence of maternal conditions or infections that were not appropriately treated in the last trimester.

- Cells10 contains fresh stillbirths that occurred during labor, suggesting a problem with labor monitoring and/or an inability to react to acute conditions during labor. This is most disturbing because these stillbirths may also indicate "near miss" maternal deaths, particularly if the mother is ill at the time of delivery.

- Cells 3, 7, and 11 are live births, but the babies died before they left the hospital (pre-discharge). This is high among all the birth-weight groups, but particularly among the normal birth weight group and suggests a problem with asphyxia that may be related to cell 10.

- Cells 4, 8, and 12 are live births who went home, returned to the facility, and died in the hospital. Importantly, in a real setting under-reporting of these deaths on an institutional basis is likely.

Remember, these are absolute numbers. These numbers need to be converted into a rate before appropriate comparisons can be made.

FIGURE 2.29
CALCULATING RATES FOR BABIES
EXAMPLE: RATE OF DEATHS DURING DELIVERY (CELLS 6 AND 10)

	During Pregnancy	During Delivery	Pre-discharge	Post Discharge	Alive	Total
≤ 1500g	Cell 1 14	Cell 2 12	Cell 3 24	Cell 4 11	Cell 17 15	Cell 18 76
1500-2499g	Cell 5 11	Cell 6 9	Cell 7 41	Cell 8 22	Cell 19 250	Cell 20 333
≥ 2500g	Cell 9 38	Cell 10 30	Cell 11 39	Cell 12 8	Cell 19 4025	Cell 22 4140
Total	Cell 13 63	Cell 14 51	Cell 15 104	Cell 16 41	Cell 23 4290	Cell 24 4549

Cell 6: 9
Cell 10: 30

Divided by

Cell 24: 4549

(9 + 30)/ 4549 x 1000 = 8.5 per 1000 total births

The expected rate for these cells is 0.2/1000 from Table 2.13. Therefore the "Opportunity Gap" compared to the Canadian standard is 8.8-0.2= 8.6 per 1000. The rate present in this population is 44 times higher than the rate experienced by the Canadian population.

Task 1: Place all the deaths and the live births in the appropriate cells by birth weight and age at death.

Task 2: Add the totals for each row to fill cells 18, 20, 22.
Add the totals for each column to fill cells 13, 14, 15, 16, 23.
Add the totals for all the rows and columns (cell 24).

Task 3: Add the deaths in cells 6 and 10 to give the totals during delivery to infants weighing greater than or equal to 1500 grams. Use this as the numerator in the fraction.

Task 4: Divide the total in cells 6 and 10 by cell 24 (denominator). Multiple the number by 1000 and express as a rate of deaths per 1000 during delivery for babies weighing greater than or equal to 1500 grams.

BABIES ACTION 3. Convert Raw Data into Rates

There are several components to this step:

- Add each cell in a row for a row total (birth-weight groups, cells 18, 20, 22 of Figure 2.29);
- Add each cell in a column for a column total (age at death, cells 13, 14, 15, 16);
- Add the total rows and columns (totals events, stillbirths, and live births, cell 24);
- Select the numerator; and
- Select the denominator.

Follow the steps in Figure 2.29 to calculate the rate of deaths during delivery (cells 6 and 10). Table 2.13 contains the definitions of several rates that can be calculated from the BABIES matrix. The first column contains a shaded replica of the color-coded matrix. The cells involved in the rate calculation still have their numbers. The calculation description is in the third column. For example, the first rate described is the Birth weight Proportionate Fetal-Neonatal Mortality Rate for the maternal health cells. It is calculated by adding cells 1, 2, 3, and 4 together as the numerator, dividing by cell 24 as the denominator, and multiplying by 1,000. It is expressed as a rate per 1,000 total births.

TABLE 2.13
SELECTED MORTALITY RATES DERIVED FROM BABIES THAT ARE USEFUL FOR PROGRAM

	Calculation to get result based on Figure 2.24	
Description of result	**Cell**	
Total fetal deaths	Cell 1+5+9+2+6+10 or 13+14	
Total neonatal deaths	Cell 3+4+7+8+11+12	
Total fetal pre-discharge deaths among VLBW infants	Cell 1+2+3	
Total fetal pre-discharge deaths among IBW infants	Cell 5+6+7	
Total fetal pre-discharge deaths among NBW infants	Cell 9+10+11	
Total fetal deaths in the during pregnancy period	Cell 1+5+9	
Total fetal deaths in the during delivery period	Cell 2+6+10	
Total neonatal deaths in the pre-discharge period	Cell 3+7+11	
Total neonatal/postneonatal deaths in the post-discharge period	Cell 4+8+12	
Birth weight proportionate mortality rate	Numerator	Denominator
Pre- pregnancy health fetal-infant mortality rate	Cell 1+ 2+ 3+ 4	Cell 24
Care during pregnancy fetal-neonatal mortality rate	Cell 5 +9	Cell 24
Care during delivery fetal-neonatal mortality rate	Cell 6 +10	Cell 24
Pre-discharge care fetal-neonatal mortality rate	Cell 7 +11	Cell 24
Post-discharge care fetal-infant mortality rate	Cell 8 +12	Cell 24
Birth weight specific (BWS) rate mortality rate	Any cell 1-12	The appropriate denominator
BWS feto-infant mortality rate for < 1500g	Cell 1+2+3+4	Cell 18
BWS feto-infant mortality rate for 1500-2499g	Cell 5+6+7+8	Cell 20
BWS feto-infant mortality rate for > 2500g	Cell 9+10+11+12	Cell 22
BWS antepartum fetal mortality rate for > 2500g	Cell 9	Cell 22
BWS inrapartum fetal mortality rate for > 2500g	Cell 10	Cell 22
BWS pre-discharge mortality rate for > 2500g	Cell 11	Cell 22
BWS post-discharge mortality rate for > 2500g	Cell 12	Cell 22

BABIES ACTION 4: Calculate the "Opportunity Gap"

Action 4 has two tasks. The first component is the selection of a standard (or comparison group). The second component is calculation of the gap in terms of time, place, person, and cause of death.

Task 1: Select a standard

A problem is a disparity between the way something is and the way you want it to be. Program managers need to compare the data from their situation with that from another, more desirable one. The discomfort associated with the results of the comparison will determine the degree to which their situation is perceived as a problem.

The infant mortality rate in a district is 75 per 1,000 live births. Unless a standard is used for comparison, a problem cannot be defined. If Sweden's NMR of 3 per 1,000 live births is used as the standard, the Opportunity Gap is 72 (75-3). If data from the capital city of the country shows that that IMR is 50 per 1,000 live births, then the Opportunity Gap is at least 25 (75-50). The degree to which this gap causes discomfort determines how much of a problem it is.

There are three possible comparison populations: an external standard, a national standard, or an internal subpopulation standard drawn from the manager's geographical area. Each is described below and their relative merits are compared in Table 2.14. The underlying question, particularly for the internal standard, is, If one subpopulation has already achieved an acceptable level of mortality, why can't the others achieve it?

External standard: This standard is most often available, usually coming from a more developed country. Such a standard can be used to describe the equity gap between countries. Objections to its use are based on the inequities in resources between developed and the less-developed countries.

National standard: This standard is usually the most acceptable because it fulfills national identity requirements. It often represents data from a more advantaged socioeconomic region in the country, which can make the gap someone else's problem among the more powerful political groups. The national standard can be used to identify the equity gap within a country.

Internal subpopulation standard: This standard is probably the most appropriate to use, but is the most difficult to develop. It requires data from a specific group, but the advantages in using these data during the analysis outweigh the difficulty in obtaining them.

TABLE 2.14
CHOICES OF A STANDARD POPULATION BY WHICH TO DEFINE THE "OPPORTUNITY GAP"

	EXTERNAL STANDARD	NATIONAL STANDARD	INTERNAL STANDARD
Strengths	Data most readily available, usually from a developed country. Describes the equity gap between countries.	Usually most acceptable (from within the same country). Can be used to identify the equity gap within a country.	May be the most appropriate. May be the best means of identifying high-risk populations requiring intervention.
Limitations	Objections to using this standard are based on the inequities in resources between countries (thus, unattainable goals).	Usually represents data from socioeconomically advantaged populations in the country (thus, may not be accepted by other groups).	Limited availability of data. Program manager may not have the skills or resources to collect these data.

Table 2.14 contains the fetal-infant birth weight proportionate mortality rates from two selected populations in developed countries. The stillbirth data available from the state of Connecticut in the United States could not be stratified into the care during pregnancy and care during delivery groups. The Nova Scotia data allow the comparison of care during pregnancy and care during delivery rates because they can be grouped according to the recommended time periods. Although these two situations have the same feto-infant mortality rate, comparison suggests that different intervention strategies are needed for further reductions in the rate. The majority of the excessive mortality in Nova Scotia is during pregnancy (1.6 per 1000), whereas in Connecticut the major problem is the pre-pregnancy health period (2.3 per 1000).

TABLE 2.15
BIRTH WEIGHT PROPORTIONATE FETAL-INFANT MORTALITY RATES THAT CAN BE USED FOR STANDARD COMPARISONS WHEN CALCULATING THE "OPPORTUNITY GAP"

	Nova Scotia, Canada (1999)	Connecticut, U.S.A. (1996)
Pre-pregnancy health	1.3	2.3
Care during pregnancy	1.6	0.7*
Care during delivery	0.2	
Newborn care	1.3	1.0
Infant care	0.5	0.9
Total fetal-infant	4.9	4.9
Profile	White women Married >20 years of age	White women >13 years of education >20 years of age
Data source	Nova Scotia Reproductive Health Program	National Center for Health Statistics Birth-Death Linked Infant Mortality tapes

*Category combined due to a lack of differentiation at the time of data collection.

Task 2: Calculate the "Opportunity Gap"

The mortality rate for each cell in the basic 12-cell table can be compared with the same cell in the chosen standard. The difference in the mortality rate for each cell is the "Opportunity Gap." Grouping the cells into the Intervention Packages described earlier is a more efficient way to make the comparison. By comparing the rate in each package, the opportunity for intervention is more clearly defined. For example, if the Pre-Pregnancy Health Intervention Package cells have a rate of 1 per 1,000, and the local rate is 10 per 1000, there is a significant gap. This can direct your questions further to identify the cause of this gap.

BABIES exercise:

Table 2.16 contains six different population-based BABIES matrixes. Rates for each of the Intervention Packages were calculated in the manner described in Figure 2.27. All of the cases are real and were chosen because of the completeness of the reporting. Cases 1 and 2 represent two subpopulations from a developed country within the same geographic region. Case 3 is from an urban setting in a developing country with a wide range of mortality rates, including some areas with fetal-infant mortality rates similar to those of Case 6. Case 4 is from an urban setting in South America. Case 5 is for a population in a Middle Eastern country. Case 6 is from sub-Sahara Africa.

TABLE 2.16
BIRTH WEIGHT PROPORTIONATE MORTALITY RATES FOR GROUPED INTERVENTION PACKAGES IN SIX SELECTED GEOGRAPHIC REGIONS AND SUB-POPULATIONS

CASE	PRE-PREGNANCY HEALTH	CARE DURING PREGNANCY/ DELIVERY	NEWBORN CARE	INFANT CARE	FETO-INFANT MORTALITY RATE
Case 1	2.1	0.9	0.8	1.2	5.0
Case 2	12.5	3.6	1.8	4.1	22.1
Case 3	1.9	9.2	8.2	3.4	22.7
Case 4	10.6	16.2	8.9	7.3	43.8
Case 5	2.5	12.6	9.5	0.8	55.4
Case 6	12.3	12.3	26.4	80.2	131.2

In order to present six cases for the exercise, data for the Care During Pregnancy package cells and data for the Care During Delivery package cells had to be combined. The denominator for these rates was cell 24 in Figure 2.29.

Compare Case 1 with Case 6. The FIMR in Case 1 is 5 per 1,000, and in Case 6, it is 131 per 1,000. Thus, the "Opportunity Gap" is 126 per 1,000 total births. The population in Case 1 has achieved a feto-infant mortality rate that is 26 times lower than that of Case 6. The largest gap occurs in the infant care package, interventions implemented in the postneonatal period after discharge from a skilled attendant. There are many cost effective interventions to reduce postneonatal mortality. Although the "Opportunity Gap" is large for all packages in Case 6, particular attention should first be given to the Infant Care Intervention Package. The situation is so bad that regardless of what the manager chooses to do, any relevant intervention done well will have an impact.

Compare Case 2 with Case 3 using Case 1 as the standard population: Both cases have the same feto-infant mortality rate. But individual comparison of the different gaps for each of the cell groupings reveals very different conclusions as to what should be done in each case. Case 2 has its largest difference in the Pre-Pregnancy Health, an "Opportunity Gap" is equal to 10.4 (12.5-2.1). A similar comparison for Case 3 reveals a difference of 0.2 in favor of Case 3. However, the largest gap for Case 3 is 8.3 (9.2-0 .9) in Care During Pregnancy. In Case 2, the impact indicators associated with Pre-Pregnancy Health need to be reviewed and the appropriate Intervention Package components need to be emphasized. In Case 3, those interventions associated with the Care During Pregnancy and Delivery need to be reviewed and the appropriate one emphasized.

Compare Case 3 with Case 5 using Case 1 as the standard population: For the last exercise, compare the Care During Pregnancy/Delivery gap in Case 3 (8.3) with the Care During Pregnancy/Delivery gap in Case 5 (11.7) - both are roughly the same magnitude. Yet, further investigation of each case reveals that the rate for C-sections (a major impact intervention in the Care During Pregnancy/Delivery) in Case 3 is 15 percent and in Case 5 it is 0.3 percent. The reason for this difference is identified through the subsequent review of the indicators associated with the Five A's. (Is the intervention available, acceptable, accessible, affordable, and appropriate?) The Five As will be discussed in more detail later in this section. In case 3, C-section were performed inappropriately resulting in excessive mortality. In case 5, although C-section were available, accessible, and affordable, the hospital where they were to be performed was unacceptable to the population.

BABIES ACTION 5. Analyze the Opportunity Gap by Time, Place and Person

During the previous actions the "Opportunity Gap" was defined in terms of the specific cell (i.e., cell 10) or in terms of the intervention package (pre-pregnancy health, care during pregnancy, care during delivery, pre-discharge care, or post-discharge care). The next step is to define the cell or gap in simple epidemiological terms (time, place, and person). The main purpose for describing the "Opportunity Gap" in these terms is to generate hypotheses as to why the gap exists.

Time analysis: Monitoring the trend of the BABIES matrix over time provides the degree of success of the interventions over time. Using the Opportunity Gap provides the necessary means to determine whether targeted populations are being adequately served to meet their needs.

Place analysis: Differences in the BABIES matrix according to place, even within districts, are key to determining the success of the intervention strategy, and identifying areas in need of service. Whether it is the village, district region, or country, it is important to determine whether differences in geography represent distinctive features of the political, economic, social, or health service environment.

Person analysis: Personal characteristics are fundamental to describing the health of a population. Characteristics such as age, education, race, marital status, socioeconomic level, risk behaviors, environmental exposures, and medical conditions help define subpopulations. These characteristics can be grouped together in a single variable with multiple categories. A commonly used sociodemographic grouping is age, race, and education and this has been previously described in Part Two, Section II. Medical profiles of subpopulations provide a means to target a subpopulation for specific medical care interventions.

Cause of death: Cause-specific mortality analysis has been a cornerstone for public health because of the ease with which it is related to intervention. This relationship, however, is not straightforward with maternal and perinatal outcomes. For many reasons, cause-specific mortality is not easily determined in most developing settings. In addition, interventions for the same cause of death are not necessarily the same. For example, asphyxia is a common cause of perinatal death. But the interventions related to asphyxia in a neonate weighing less than 1,500 grams are different from those most likely needed for a death in a neonate weighing greater than or equal to 2,500 grams.

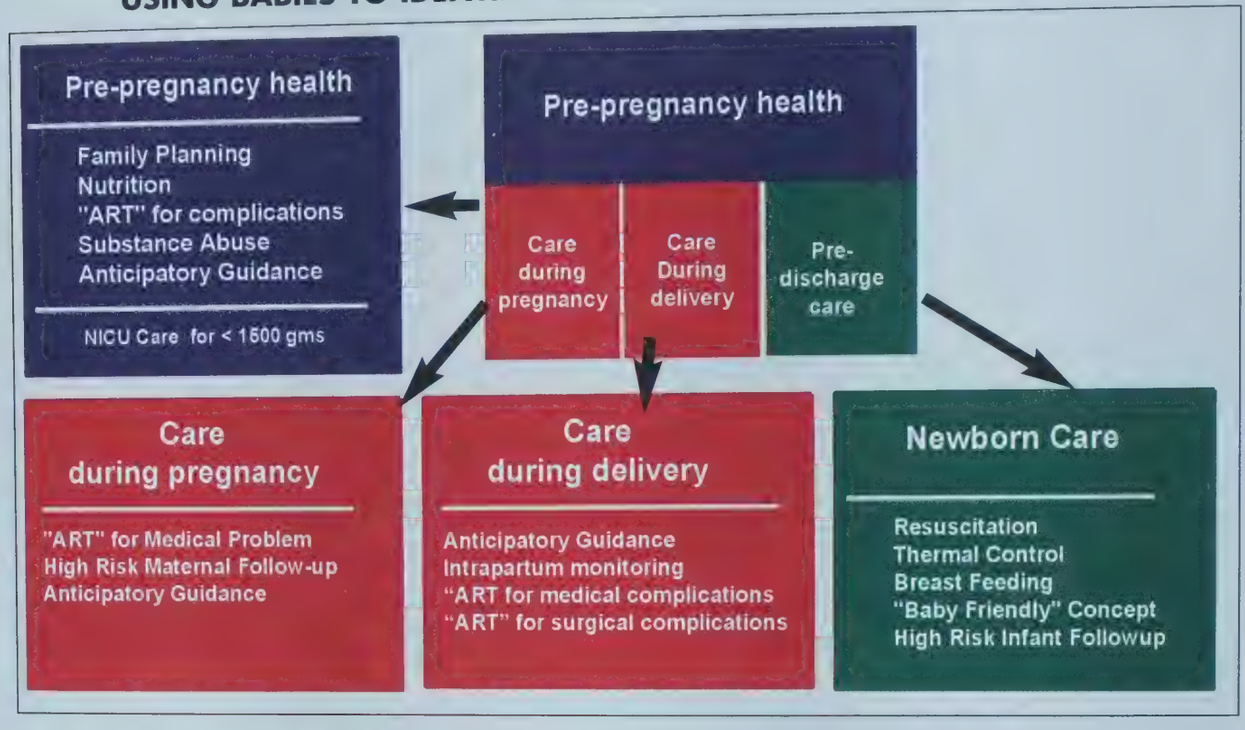
- **Unknown or unreliable cause of death:** In situations where the cause of death is unknown or unreliable, what can be done? Based on the pattern of data in terms of the intersection of birth weight and time of death, an inference can be made about causes of death. If the observed rate of the cell exceeds the expected, then the interventions meant to prevent those deaths are either not being carried out or they are being implemented incorrectly for some reason.

- **Reliable cause specific mortality:** In situations in which cause-specific mortality is reliable, one can be much more direct with the chosen intervention. The first step is to compare the cause-specific mortality rates for infants weighing greater tha or equal to 2,500 grams for defined geographical or institutional settings in the cells with optimal values. The "Opportunity Gap" can be identified again by comparison with a standard, such as the accepted mortality rate for deaths from neonatal asphyxia in a given birth-weight group. Problems can be identified by deviations from the chosen standard.

BABIES ACTION 6. Choose the Cell or Group of Cells Upon Which to Focus

The category with the largest "Opportunity Gap" may provide the program manager with an opportunity to reduce the greatest portion of the gap. However, some interventions may be more feasible and still address a significant portion of mortality. For example, neonatal tetanus may be easier to address than asphyxia among preterm babies. The manager needs to review underlying causes, such as poor quality obstetric care or delays in access to care, and make a decision about which the package is most feasible for the situation. Section V provides management tools to do this.

FIGURE 2.30
USING BABIES TO IDENTIFY PRIORITY INTERVENTION PACKAGES



BABIES ACTION 7. Assess Performance with Regard to the Chosen Focus Cell

Review the data about interventions relevant to that cell. One aid is the Five A's. Is the intervention available (capacity, knowledge, skills, and materials)? Is the intervention accessible (physically)? Is the intervention acceptable (culture, gender)? Is the intervention affordable (transportation, costs)? Is the intervention appropriate (according to standards/protocols)? Much more detail on possible interventions for each of these time periods will be described in the packages section in Part Four and the performance assessment section in Part Three. The program manager must develop a system of outcome and process indicators to monitor and evaluate the program.

BABIES ACTION 8. Select Outcome and Process Indicators for Your Program and Develop the Local HMIS

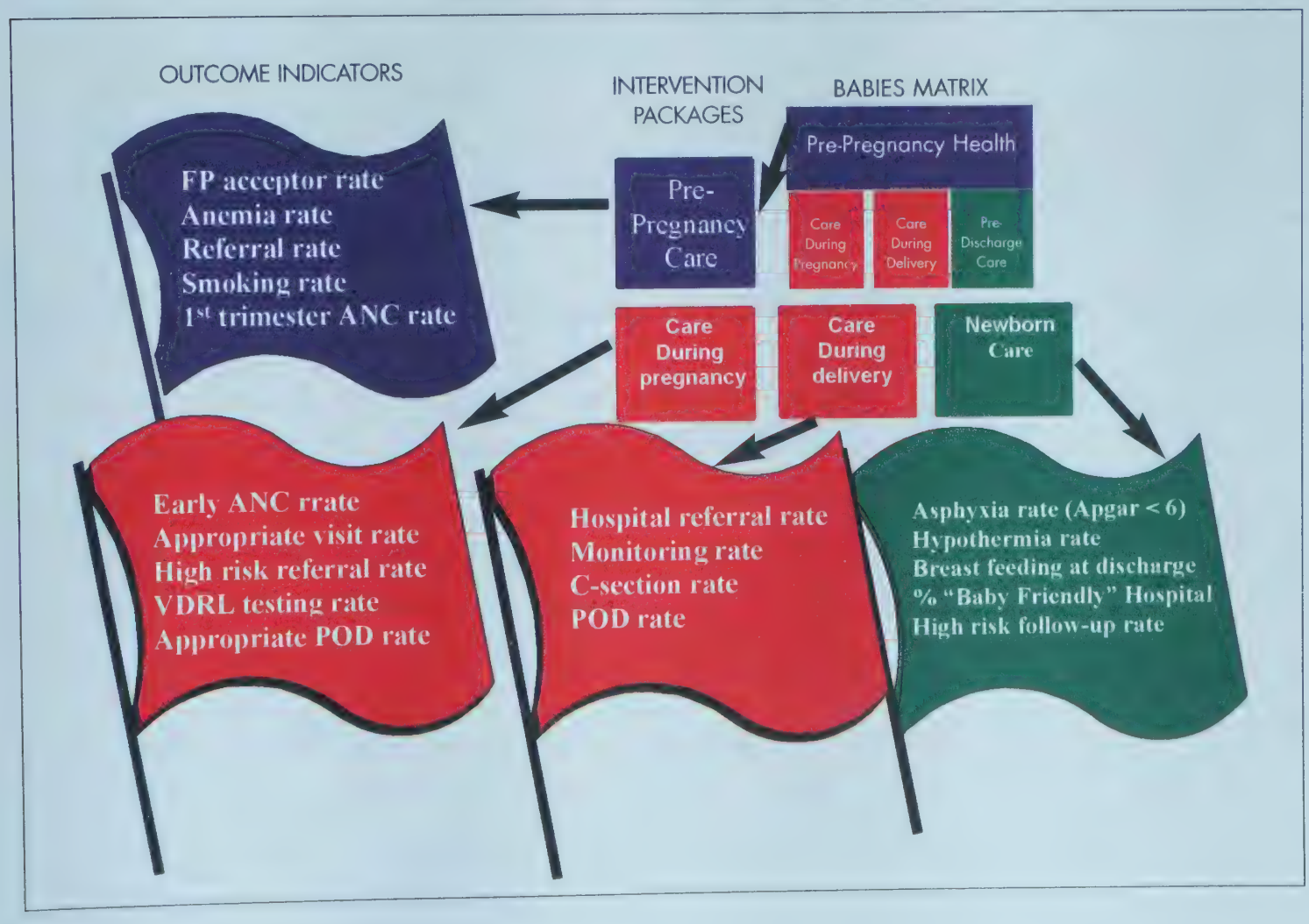
Resources, available technology, local concerns, existing services, current coverage of the population, and the ability to coordinate activities among the various partners are all elements in developing a strategy. The BABIES matrix links the "Opportunity Gap" with the Intervention Packages (Figure 2.30). These interventions have an associated impact indicator (Figures 2.29) that provides the program manager with a systematic way to set goals and objectives for the program. The program manager can avoids outcome displacement by using BABIES as the starting point for choosing of Intervention Packages.

BABIES ACTION 9. Repeat the Above Steps in a Continuous Cycle of Improvement

Outcome and process indicators for the intervention packages are chosen by the process previously described. Section V includes quality management tools that help determine which indicators meet the need of a given situation. It is important to identify the response to each of the indicators, so that what is supposed to happen when the indicator flag is raised is clearly understood.

BABIES ACTION 10. Select the Intervention Strategy and Establish Goals and Objectives

FIGURE 2.31
USING BABIES TO IDENTIFY INDICATORS ASSOCIATED WITH INTERVENTION PACKAGES



PANEL 2.3
LESSON LEARNED

THE COMMUNITY REVISES ITS MONITORING BOARD

In Kimba District, Tanzania, each pregnant woman in the village is represented by a pin. The pin is placed in the upper left-hand corner of the CMB. Upon completing the pregnancy, a separate pin for each mother and newborn is placed in the appropriate cell. Their objective is that all pins will be placed in the middle green column at birth and that all the mothers and babies make it to the green column at the far right. Since this is a real –time board only 60 percent of the population of mothers and infants have been followed to 9 months of age. It is not difficult to draw the conclusion that deaths during delivery are a major problem. Upon review, transportation during labor was identified as the key issue and the villages developed interventions plans to solve that problem.



Every pregnancy counts, so account for every pregnancy CARE

Pregnant women	Abortions	Fetal death		Alive at birth	Kifo baada ya kujifungua						Survivors @ 1 year
		Antepartun fetal death	Intrapartum fetal death		< 24 hours	Day 1-<7	Days 7-28	Days 29-42	Months 2-6	Months 7-12	
			3	633	2						631
		5	7	516	2	4	4	2	2	1	501
		4	3	62	2	4	1	0	1	0	54
	0	7	4	20	6	5	1	0	0	0	8
Total	0	16	14	598	10	13	6	2	3	1	563

BABIES SUMMARY

BABIES (Birth weight and Age-at-death Boxes for an Intervention and Evaluation System) is an adaptable assessment tool that allows the program manager to collect, organize, analyze, and translate data into information for newborn health intervention. It combines two pieces of data:

- Age at the time of death of the fetus/newborn; and
- birth weight group.

BABIES is a simple system to define the newborn health problem, assess the performance of the HCDS, select effective interventions, and perform monitoring and evaluation.

BABIES brings together five concepts to assist the program manager to make decisions:

Concept 1	Time: age at death of fetus/neonate.
Concept 2	Birth-weight group or birth size of fetus/neonate.
Concept 3	Think in two dimensions – the birth weight and time at death matrix.
Concept 4	Interpreting the cells in BABIES and grouping into intervention packages.
Concept 5	The "Opportunity Gap."

There are ten action steps for implementing the BABIES matrix:

Action 1	Review data and adapt the matrix to program setting.
Action 2	Plot the data into the matrix.
Action 3	Convert raw data into rates.
Action 4	Calculate the "Opportunity Gap."
Action 5	Analyze the "Opportunity Gap" by time, person, place.
Action 6	Choose the cell or group of cells upon which to focus.
Action 7	Assess performance with regard to the chosen focus cell.
Action 8	Choose the intervention strategy and establish goals and objectives.
Action 9	Select outcome and process indicators for your program and develop HMIS.
Action 10	Repeat the cycle to achieve continuous improvement.

Indicators derived from BABIES serve as the outcome indicators for defining the "Opportunity Gap". In turn, these indicators are linked to impact indicators derived from the Intervention Packages for reducing the gap. In the next section, BABIES is linked to the quality management process. And in Part Three, monitoring and evaluation components of the step-by-step approach are outlined.

V. QUALITY MANAGEMENT IN NEWBORN HEALTH PROGRAMMING

A. The Principles of Quality Management

What is quality?
Many definitions of quality have been proposed. Quality of care must be defined in the light of technical standards and clients' expectations. While there is no single definition of health service quality that applies in all situations, the definitions presented below may be helpful guides.

> *Quality is... "proper performance (according to standards) of interventions that are known to be safe, that are affordable to the society in question, and that have the ability to produce an impact on mortality, morbidity, disability, and malnutrition."*
>
> - M.I. Roemer and C. Montoya Aguilar, WHO, 1988

> *"Doing the right thing right, right away."*
>
> - Advocates of total quality management

> *"Quality is meeting the patient needs and reasonable expectations."*
>
> - Louis Smith, CDC.

Quality can be assessed only if there are standards with which to compare current practices. Standards/guidelines outline specific actions in a given clinical situation (i.e., WHO guidelines for care in pregnancy and childbirth), or they can describe appropriate ways to serve clients (i.e., showing respect). Although high quality may have a cost, the lack of quality also has a substantial cost. Unfortunately, the lack of quality is often paid through the loss of human life, resulting in the high maternal and fetal-neonatal mortality rates that exist today.

Quality and the program manager

Successful program managers need to be able to:

- manage human resources to increase productivity and quality of services through development of teams;
- obtain, allocate, and manage material resources;
- determine and justify priorities for interventions and allocations;
- monitor the effectiveness and efficiency of the program; and
- allocate and maximize their time and skills.

The aim of good management is to improve quality, not simply to "deliver the goods". Improvement involves building the capacity of the system and promoting sustainability.

The quality management process provides a mechanism for continuous on-the-spot improvement. Quality planning takes place by integrating one comprehensive planning system, communicating well up and down the organization, coordinating vertically and horizontally, and involving all participants in broadly defining the mission, vision, and detailed objectives of the program.

Quality management provides a framework for ensuring continuous improvement and a common language for talking about quality. Management information systems and computer applications provide information for intervention. Resource allocation and logistics management depends on factual information about needs, supply consistency, costs, and contingencies. Program managers must know how to produce documents for supply management and how to evaluate a supply system. From these agendas, program managers can develop health policies based on established priority needs and a cost-benefit analysis. Evaluation will be based both on outcome and on process.

Many publications promote the quality concepts and process. Whether this process is called Total Quality Management (TQM), Quality Assurance (QA), Continuous Quality Improvement Program, or the Quality Improvement Story is unimportant. All of the programs have similar components and basic steps that have the same goal - to improve quality. This section presents only the basic concepts, but more information on this topic is provided on the CD-ROM including the CDC's TQM Workbook, USAID's Quality Assurance Project materials, and CDC's Program Management: A Guide for Improving Program Decisions. Much of this section is adapted from these materials.

TOTAL: The loyalty and intelligence of every employee must be fully developed and used. Quality is everyone's responsibility. Quality can and must be supported at the upper levels of management, but the actual achievement of quality takes place at the interface between the patient and the service provider in the home or health care institution.

QUALITY: Quality management is a process to ensure patient or client satisfaction through involvement of all employees in reliably producing and delivering quality products or services. A process is a repetitive and systematic series of actions or operations in which resources are used to develop or deliver products or services. Processes involve people, activities, and methods.

MANAGEMENT: Management is a process by which one plans, implements, and evaluates an organized response to a health problem[12]. The health programming model consists of all the people and actions whose primary purpose is to improve health. In this model, people, technology, and resources are organized and directed toward the solution of a problem through management. The program manager's skills are crucial to success.

B. The Quality Triangle

The key building blocks for quality are policy management, the team, and daily attention to quality work.

- **Policy Management:** Quality improvement needs to be supported by enabling policies, which creates an enabling institutional environment to support the quality improvement practices. The quality management process replaces many old management tenets with more modern ones. For example, the function of a supervisor changes from that of an inspector general to that of a facilitator. Supervisors work for employees as much as employees work for supervisors. Another paradigm shift in management involves who defines quality in terms of service. In the old environment, managers say they know what the customer wants and what quality is. In the quality management environment, the patients participate directly in the definition of quality.

Since the people who are doing the job are the experts, they will often have the best solutions to the problem. By using quality management techniques, the team can identify mistakes and deficiencies, learn from them, correct them, and continue to improve the program.

- **Teams:** A team is a high-performance task group whose members are interdependent and share common performance objectives. A team's purpose is to improve the quality of products and services, develop the skills and abilities of the team members, promote communication and working together, and enhance the quality of work life. Teams have structure, focus, and procedures that are important to them and, more importantly, to their patients. Basic types of teams include task, functional, cross-functional, and lead teams.

  Teamwork is an essential element of quality management, requiring planning and clear communication. In providing a structured environment for employees to work together, quality teams identify a problem area and reasons for solving the problem, select a workable problem and set targets, analyze the problem's causes, plan and implement countermeasures to correct those causes, confirm that the problem has been improved and the targets met, prevent future occurrence of the problem, and plan for solving other problems.

  Consensus, which implies voluntary consent, is the primary method of team decision-making. Although everyone might not share the same degree of enthusiasm for the solution, they must agree to support it. Consensus promotes a win-win situation and provides some level of ownership for the decision or solution. The consensus process can be a good team-building tool. Everyone involved in the discussion explores alternatives, encourages differences to clarify issues, and is cautious of quick solutions. The team uses data to make consensus easier, thus abiding by one of the fundamental principle, management by fact.

  A more complete description of teams is found on the CD-ROM.

- **Quality in daily work:** Quality is a broad concept. Experts describe several distinct quality dimensions that vary in importance depending on the context in which the team operates (Table 2.16). Not all eight dimensions deserve equal weight in every program. Activities may address one or more dimensions. The dimensions of quality are a useful framework that helps health teams define and analyze their problems and to measure the their results compared to program standards. The eight dimensions are briefly discussed in Table 2.16. More details are available on the CD-ROM.

TABLE 2.17
DIMENSIONS OF QUALITY

DIMENSION	DEFINITION
Access to services	Access means that health care services are unrestricted by geographic, economic, social, cultural, organizational, or linguistic barriers.
Amenities	Amenities refer to the features of health services that do not directly relate to clinical effectiveness but may enhance the client's satisfaction and willingness to return to the facility for subsequent health care needs.
Effectiveness	The quality of health services depends on the effectiveness of service delivery norms and clinical guidelines. Assessing the dimension of effectiveness answers the question. Does the procedure or treatment, when correctly applied, lead to the desired results?
Efficiency	The efficiency of health services is an important dimension of quality because it affects product and service affordability and because health care resources are usually limited.
Continuity	Continuity means that the client receives the complete range of health services that he or she needs, without interruption, cessation, or unnecessary repetition of diagnosis or treatment.
Safety	Safety means minimizing the risks of injury, infection, harmful side effects, or other dangers related to service delivery. Safety involves the provider as well as the patient.
Technical competence	Technical competence refers to the skills, capability, and actual performance of health providers, managers, and support staff.
Interpersonal relations	The dimension of interpersonal relations refers to the interaction between providers and clients, managers and health care providers, and the health team and the community.

Source: Quality Assurance of Health Care in Developing Countries, USAID QAP/CORE/CSTS, June 1999.



C. Foundational Principles for Total Quality Management

There are four foundational principles that apply to total quality management: client satisfaction, management by fact, the plan-do-check-act cycle, and respect for people.

TQM PRINCIPLE 1: Client Satisfaction

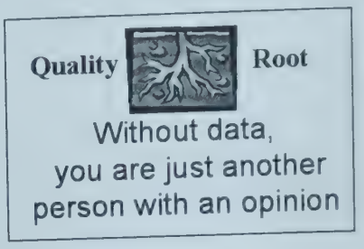
Quality management promotes a client-centered orientation within organizations. Everyone in a quality organization is part of a client-provider chain. The program manager must first align patient needs and provider capabilities and then must meet reasonable, agreed-upon requirements.

TQM PRINCIPLE 2: Management by Fact

At the root of quality management is management by fact. Decisions are made and actions carried out by translating data into information rather than trusting instinct, perceptions, or individual prejudices. In the management by fact environment, everyone has a common framework for understanding what needs to be done and what is being done. Communication is more direct, execution more predictable, and evaluation more reliable. Data are more likely to be correct and serve as a common understanding. This is emphasized and applied throughout Part Three.

Management by fact includes three processes:

- collect objective data to validate the information;
- analyze the data; and
- respond by using facts as the basis for action and make decisions based on these data rather than on instinct, preconceptions, or prejudices.



In many situations, teams are data-rich but information-poor. In Section II, information was defined as a difference that makes a difference. More thought needs to go into the analytical step by which data are transformed into indicators. The degree and/or frequency of conformance of the quality indicators help the program manager measure the gap between what is and what should be. Such measurement compares the program's present performance versus the client's requirements, and leads to the understanding that…

> …If you can't measure it, you can't manage it.

As previously discussed, the "Opportunity Gap" is the disparity between what is observed and what is expected. It helps to answer the question, *Have we chosen the right things to do?* When the "Opportunity Gap" is defined in terms of total quality management, the main questions are:

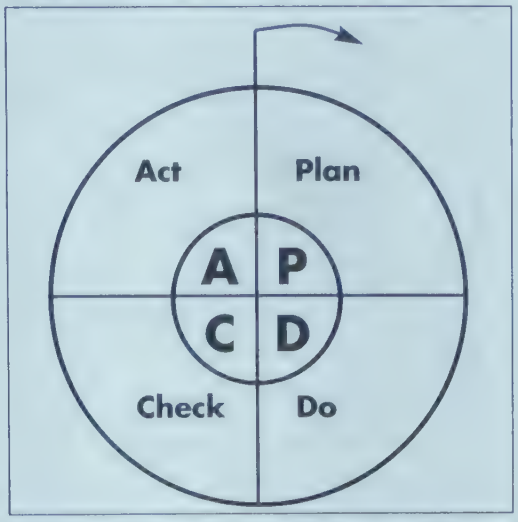
> What is *currently happening* with the process/product/service that is the target for improvement?
>
> What *should be happening* with the process/product/service that is the target for improvement?

This distinction helps us answer the question, *Are the interventions being done in the right way?*

TQM PRINCIPLE 3: The Plan-Do-Check-Act Cycle

The plan-do-check-act (PDCA) cycle (Figure 2.32) provides a simple model that corresponds to the way human beings operate. It begins by setting goals based on client needs and planning how to achieve them (Plan). It continues by implementing or trying out what is planned to see how it works (Do). It performs checks during and after the service, gathers and analyzes data to find out what happened, what worked, and what did not (Check). Then, on the basis of the analysis, it acts to improve the service (Act).

FIGURE 2.32
PLAN-DO-CHECK-ACT CYCLE



TQM PRINCIPLE 4 Respect for People

High quality is attained only through full employee commitment and participation. People have needs just as the organization does. Program managers and supervisors should treat their team members as they want their clients to be treated. The quality management model creates a sense of purpose in the workplace and keeps employees informed and involved. Most important, it trains employees so they are the best they can be for clients and for themselves. Every team will have financial constraints, but the quality management process helps use the resources in the most effective and efficient manner. It helps employees communicate better, and authority and responsibility are delegated whenever practical.

D. Quality Improvement Story

The quality improvement (QI) story is a seven-step problem-solving process. It is a systematic, data-based approach to problem-solving. The QI story helps a team to organize, collect and analyze data, and to determine how well they are doing. It is a guide to the problem-solving process, and it helps the team use the Plan-Do-Check-Act cycle in the problem-solving process. Figure 2.33 is a pictorial representation of the QI Story and some of the tools used in the process. Throughout the description of the QI story, quality tools will be mentioned without defining them, but they will be defined later.

FIGURE 2.33
QUALITY IMPROVEMENT STORY

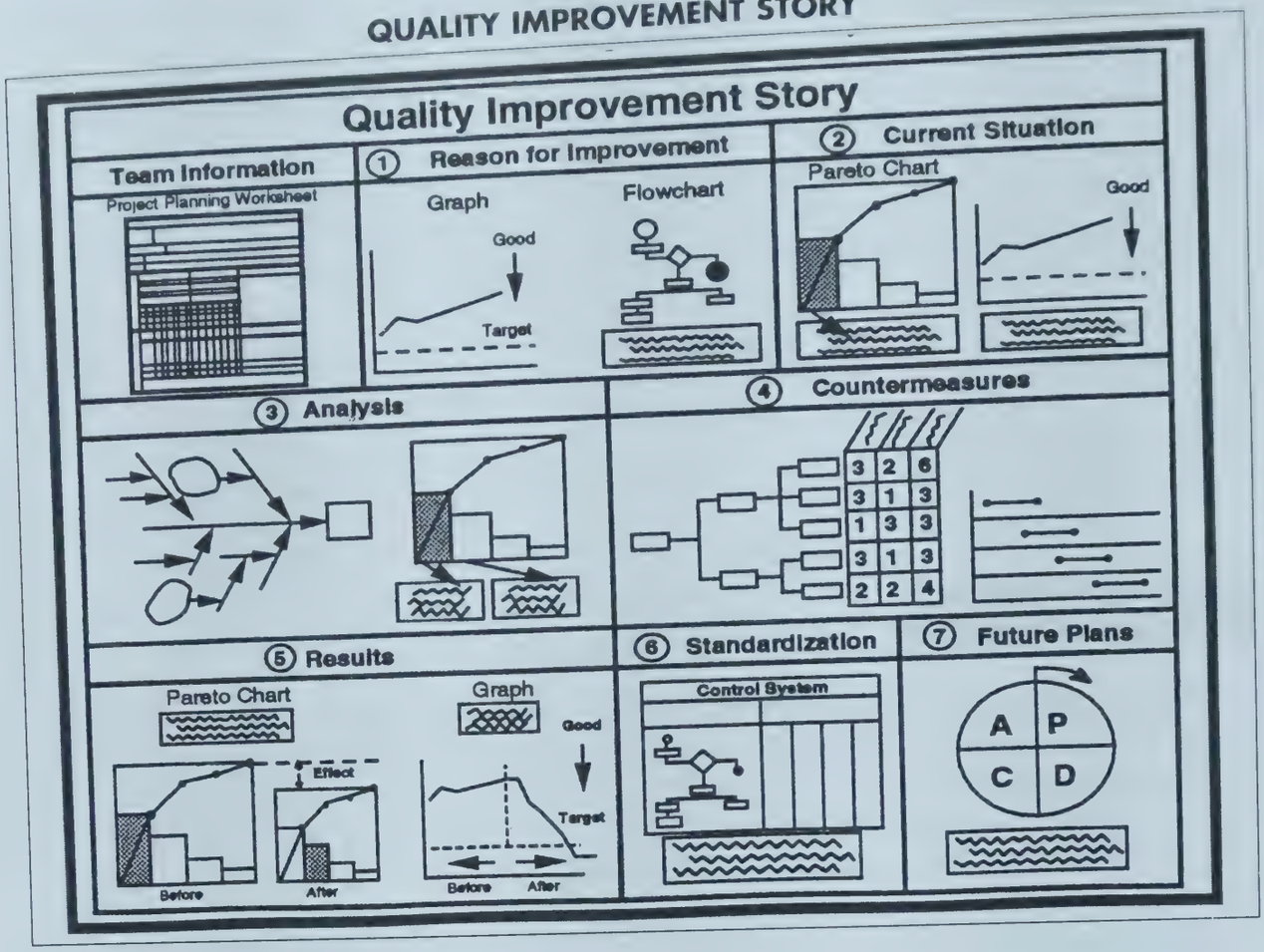


TABLE 2.18
STEPS IN THE QUALITY IMPROVEMENT STORY

QI step 1.	The reason for improvement.
QI step 2.	Current situation: what exactly is the problem?
QI step 3.	Analysis: what is causing the problem?
QI step 4.	Countermeasures: what are we going to do about what is causing the problem?
QI step 5.	Results: how well did we do in eliminating the problem?
QI step 6.	Standardization: how do we maintain the goal?
QI step 7.	Future plans: what is next?

QI. Step 1. The reason for improvement: This step is in Plan part of the plan-do-check-act cycle. A problem exists! The objective of the step is to identify a **theme** (problem) and the reason for working on it. Using the **theme selection matrix** and other tools, a problem is selected. The selection should be based on collected data (facts) and should be patient-oriented. There should be a graph or chart showing the quality indicator that will be used to track progress in reducing or eliminating the problem. The same type of graph will be used later in Step 5 for comparison. A **flowchart** may or may not be necessary, but one should generally be developed for short-cycle time processes.

At the completion of Step 1, the team has written a **theme statement** and identified an indicator that accurately represents its variation. The gap between what is and what should be (a numerical indication of our problem) will be the reason for improvement. A plan or schedule for completing the QI story steps may be completed.

QI. Step 2. Current situation: What exactly is the problem?: This step is in the Plan part of the plan-do-check-act cycle. After selecting a problem, the team sets a target for improvement based on the gap between what is and what should be. Different products are produced in this step. Data will be collected (if they do not already exist) on all aspects of the theme by means of **checksheets,** and they may be displayed several different ways. The **Pareto** chart shows relative significance and is most often used to stratify the theme into manageable chunks. It also shows us which aspect of the theme is most important and most urgent to address. **Stratification** must continue until the problem is specific enough to analyze. The graph selected to track the problem will also be used to compare progress on resolving the problem in Step 5, and it may be different from that used in Step 1. (Step 1 generally uses a line graph, Step 2 generally a Pareto chart.) Table 2.19 contains the characteristics of a good problem statement and gives an example.

At the completion of QI Step 2, the team should have a reasonable, written theme (problem) statement addressing the gap, a numerical objective for the team to use as an improvement goal, and valid customer requirements. A management presentation is now given to get management's approval to work on the problem and use resources.

Example: Writing a problem statement and setting a an objective for improvement (What is our problem, exactly? How much can we improve right now?) (Table 2.19.)

TABLE 2.19
PROBLEM STATEMENT EXAMPLE

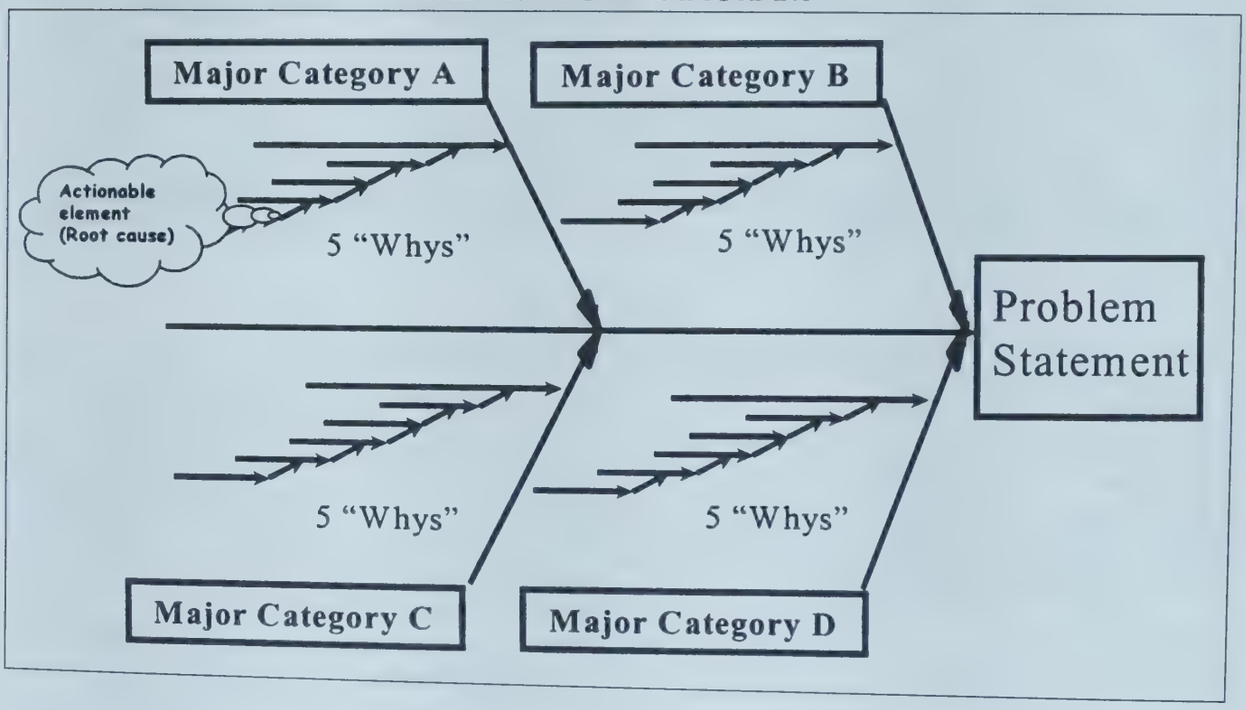
Criteria	(A)	(B)	(C)	(D)	(E)	(F)
Problem Statement (Who, what, when, where, how, how many.)	**States What is wrong?" – the effect**	**It is measurable**	**It is specific. Avoids broad categories.**	**Focuses on the gap between what is and what should be.**	**Stated objectively? Avoids questions?**	**Focuses on the "pain" how customers are affected.**
In 1998, the NMR was 10% higher than the objective, increasing our regional mortality and jeopardizing donor funding for prevention strategies.	Yes	Yes	Yes	Gap is clear. 10% too high.	Yes	Yes, explicit.

Objectives are steps to meeting a goal. The goal in this example could be to meet the NMR goal in the year 2002. Objectives should be challenging but achievable in a reasonable time, typically in a year or preferably less. Remember, the team is trying to lessen the effect of the problem area or theme by reducing a specific problem that is a major contributor. The problem area or theme from which this problem statement might have been stratified could be, "To lower our country's maternal and infant mortality rates to 15/1000, the lowest in the region or lower." Example objectives:

1. Reduce the neonatal mortality rate by 5 percent in 2 years.
2. Reduce the neonatal mortality rate by 2 percent per year.

QI. Step 3. Analysis: What is causing the problem?: This step is in the Plan part of the plan-do-check-act cycle. Its objective is to identify and verify the root cause(s) of the problem. The team completes a cause and effect analysis using the cause and effect or fishbone diagram (Figure 2.34). The team verifies the root causes with data to support their conclusions. They may need to run some experiments or collect data over time. The root causes must be based in fact and taken down to a cause on which the team can take action.

FIGURE 2.34
THE FISHBONE DIAGRAM

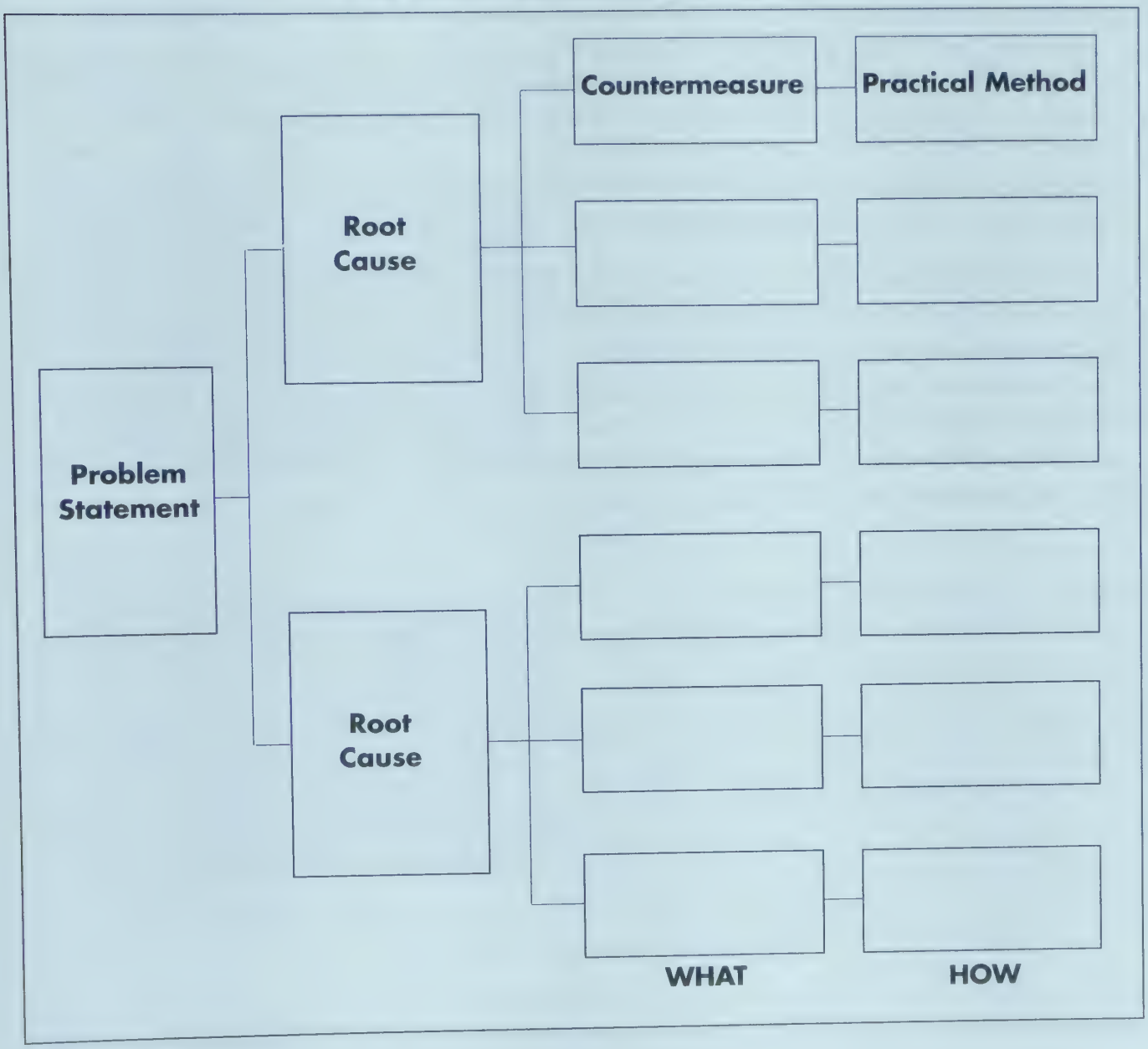


Since the fishbone diagram is so important to the quality management process, its construction is reviewed here. The fishbone diagram construction starts with the problem statement the team developed in the previous steps (placed in the head of the fish). The team decides on the major categories under which a root cause might fall (the major boxes in Figure 2.33). The five generic categories are people, methods, machine, material, and environment or others the team feels are appropriate. These major categories can be obtained from brainstorming and looking at the process flowchart if available, major process activities, significant geographic areas, or other analysis on the problem statement. For each of the major categories the team will ask a series of logical questions along the skeleton (bones) of the major categories. The team asks "why" five times for each bone, or until the team reaches an actionable level. The team uses the process just described to arrive at two or three actionable items. After completing several logic chains, the team circles the most likely root causes for further verification by data. Another applied example is given in Part Three (Figure 3.2).

At the completion of QI Step 3, the team should have identified the actionable root cause with the greatest probable impact and verified it as a root cause with data. This can be done through the use of scatter diagrams, interviews, surveys, etc.

QI. Step 4. Countermeasures: What are we going to do about what's causing the problem?: This step is in the Do part of the plan-do-check-act cycle. The objective of this step is to identify, plan and implement countermeasures (proposed solutions) that will correct the identified root cause(s) of the problem. The team uses a countermeasure matrix (Figure 2.35) to select the most effective and feasible countermeasure(s), consistent with the patient's valid requirements, which should reduce or eliminate the problem (or parts of it). An action plan for implementation of the countermeasure(s) shows who takes what actions, when they take them, where they take them, and how they are taken.

FIGURE 2.35
THE COUNTERMEASURE MATRIX



Since the countermeasure matrix is so important to the quality management process, its construction is reviewed here. After verifying the significant root causes, the team fills in what it can of the first two columns in Figure 2.35, the problem statement and root causes. Next, the team identifies countermeasures that address each root cause. A countermeasure is ***what*** the team proposes to do to reduce or eliminate the corresponding root cause. For each countermeasure, one or more practical methods, or specific tasks, that will enable the implementation of the countermeasures are discussed. A practical method answers ***how*** the countermeasures will be accomplished. The team now estimates the effectiveness of the countermeasures at reducing or eliminating the root cause. Higher ratings go to those estimated to be more effective. The team next estimates the feasibility of the practical methods. This estimate usually includes consideration of cost, time, personnel, and other factors relevant to the situation. The team decides whether to implement countermeasures, and how many on the basis of the available resources and the urgency of the need to meet the improvement target. In this action the team is evaluating the effectiveness of the countermeasure and the feasibility of the practical method.

Consensus in decision-making is needed during the use of the countermeasure matrix. As a last resort, numerical ratings may be averaged to arrive at an overall rating for a given countermeasure or practical method.

At the completion of QI Step 4, the team has definite plans for implementing a countermeasure and for monitoring its effectiveness in reaching their target. Before implementation, a management presentation is given to get management's approval to actually change the way some persons do their business. Management will also provide assistance in getting the needed support from other parts of the organization.

QI. Step 5. Results: How well did we do in eliminating the problem?: This step is in the Check part of the plan-do-check-act cycle. The objective is to determine whether the problem and its root causes have been decreased and the target for improvement has been met. The team compares the data collected (monitoring the effect of the countermeasure) with the data collected and plotted in Step 2. The same graph and indicator must be used to make a comparison valid and easy to understand. Each previous step had considerable activity, but QI Step 5 has much less because it is simply a comparison of two sets of data.

At the completion of QI Step 5, the team has measured how close they came to meeting their target for improvement. They leave QI Step 5 with another decision. Did they do well enough? If so, they can move to Step 6. If not, they may need to go back to Step 4 and implement another countermeasure, or go back to Step 3 and identify some additional root causes.

QI. Step 6. Standardization: How do we maintain the gains?: This step is in the Act part of the plan-do-check-act cycle. The objective is to prevent the problem and its root causes from recurring. The team must put in place the structures and systems to make the countermeasure part of daily work. Employees may need to be trained in the new procedures, and checks should be put in place to monitor their effectiveness. Specific areas are considered for replication of the new procedures. Any other parts of the organization that can benefit from the improvement are given the details of the countermeasure.

At the completion of QI Step 6, the team should have clearly met the target set in QI Step 2 or have come close enough to meet the patient's valid requirements. They should have taken the necessary actions to maintain the improvements achieved thus far.

QI. Step 7. Future plans: What is next?: This step is in the Act part of the plan-do-check-act cycle. The objective is to evaluate the team's effectiveness and decide what is to be done with any remaining problems. The team considers any remaining problems from QI Step 2 as well as any remaining themes from the theme selection matrix in QI Step 1.

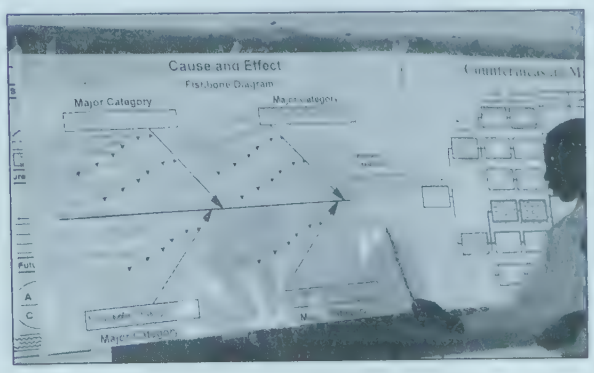
At the completion of QI Step 7, the team should have plans for further problem-solving actions or plans for maintaining their gains and looking for more improvement opportunities. In Table 2.18, the seven steps are listed, tools and techniques are identified, and objectives and checkpoints provided for each of the steps. Panel 2.5 gives a description of improving the quality of obstetric services in Guatemala as an example of how it is all brought togeher.

PANEL 2.4
LESSONS LEARNED

USING FISHBONE

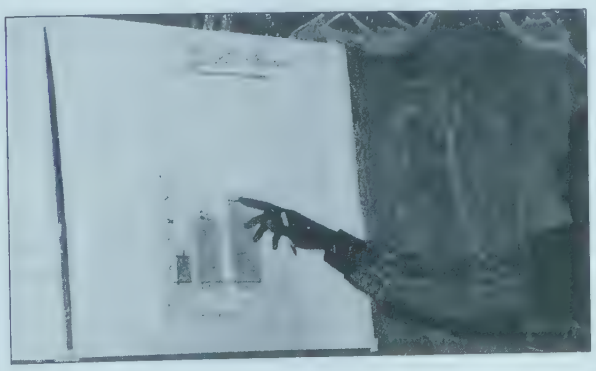
In Tanzania, health care workers wanted to assess why women would not deliver at the health center or remain in the center after birth for a 24-hour period.

The main categories of their fishbone were culture/taboos, space not sufficient, staff, and money. After asking the five why's for each of the categories, the team identified several actionable clouds. The root causes were the community's cultural concerns about a man being present at delivery, insufficient measures to ensure privacy during postpartum care, failure of a female-in-charge always to be present for deliveries, and the lack of community knowledge of the importance of delivering at the facility and remaining for at least 24 hours.



The main countermeasures were education and renovation of the facility

The goal for the dispensary was to go from zero to 25 percent of women delivering at the facility within 3 months and to have all the women stay at least 24 hours or more. Initially, the team focused on the women, staying 24 hours after delivery, but the problem was re-examined and the main focus shifted to increasing the number delivering at the facility. The main root cause for that problem was thought to be the lack of a female attendant.



They successfully requested district health management team to provide a midwife. At the same time, the village committee funded a curtain to partition the postpartum room to provide privacy. Deliveries rose from 9 to 21 to 33 (as seen in the histogram in the figure to the left) over the course of 3 months within the quarter. In the last month, 75 percent of the women stayed 24 hours or longer. The prolonged stay also provided an opportunity to develop a register book in which staff record the name, time arrived, time left, and vaccinations received, and they develop a plan for follow-up care if necessary.

Source: Unpublished report, CARE/CDC Health Initiative Project in Kwimba District, Tanzania, (2000).

E. Quality Tools

Many quality tools are at the disposal of the program manager. To the beginner, their number and complexity might seem overwhelming, and therefore discourage their use. It is important to remember that 80 percent of problems can be solved with three analytical tools, 95 percent can be solved with seven tools. Table 2.20 reviews the QI story and briefly introduces some of the tools.

Table 2.20 outlines which steps in the QI story the can best be utilized.

TABLE 2.20
THE QI STORY REVIEW

QI STORY STEPS	TOOLS/TECHNIQUES	OBJECTIVE AND CHECKPOINTS
PLAN		
① Reason for improvement (A problem exists)	Project planning sheet Graph _____ Control Chart _____ Process flowchart _____ Other: _____ _____	*To identify a theme (problem area) and the reason for working on it.* 1. The criteria for selection were customer-oriented. 2. The indicator correctly represented the theme. 3. The need for improvement was demonstrated with data. 4. A schedule for improvement was demonstrated with data.
② Current situation	Control Chart _____ Histogram _____ Graph _____ Pareto Chart _____ Checksheet _____ Other _____ _____	*To select a problem and set a target for improvement.* 5. The situation was stratified to a component level specific enough to analyze. 6. Customers valid requirements were identified. 7. The problem statement addressed the gap between the current and targeted values. 8. The methodology used in establishing target/goal was identified.
③ Analysis	Cause and effect Analysis _____ Histogram _____ Graph _____ Pareto chart _____ Scatter diagram _____ Checksheet _____ Other _____	*To identify and verify the root causes of the problem.* 9. Cause-and-effect analysis was performed on the problem. 10. Root causes were taken to an actionable level. 11. Root causes were taken to an actionable level. 12. Data were used to verify the root causes.
DO		
④ Counter-measures	Cost estimation _____ Countermeasures matrix _____ Barriers and aids _____ Action plan _____ Other _____ _____	*To plan and implement countermeasures that will correct the root causes of the problem.* 13. Selected countermeasures attacked the verified root causes. 14. Countermeasures were consistent with meeting customer valid requirements. 15. Countermeasures were cost-beneficial. 16. Action plan answered who, what, when, where, and how. 17. Action plans reflected the barriers and aids necessary for successful implementation.
CHECK		
⑤ Results	Graph _____ Control chart _____ Pareto chart _____ Histogram _____ Other _____ _____	*To confirm that the problem and its root causes have been decreased, and the target for improvement has been met.* 18. Root causes have been reduced. 19. Tracking (quality) indicator was the same one used in Step 1 – Reason for improvement. 20. Results met or exceeded target (if not, cause was addressed).
ACT		
⑥ Standardization	Control chart _____ Graph _____ Control System _____ Procedure/Std. _____ Training _____ Other _____	*To prevent the problem and its root causes from recurring.* 21. Method to assure that countermeasures become part of daily work was developed (include applicable training). 22. Periodic checks were put in place with assigned responsibilities to monitor the countermeasures. 23. Specific areas for replication were considered.
⑦ Future plans	Action plan _____ Other _____ _____	*To plan what is to be done about any remaining problems and to evaluate the team's effectiveness.* 24. Any remaining components of the theme will be addressed. 25. Applied PDCA to lessons learned.

TABLE 2.21
SELECTED QUALITY MANAGEMENT TOOL DESCRIPTION

	WHAT IS IT?	WHY IS IT USEFUL?	WHEN IS IT USED?
Brainstorming	A way to use a group of people to quickly generate, clarify, and evaluate a long list of ideas.	Makes use of creative thinking and encourages participation.	Anytime data gathering is needed ...to collect problem areas, identify root causes, flowchart, identify countermeasures, etc.
Theme selection matrix.	A technique that helps the team quickly select a problem area.	Allows teams to rank the 3-5 problem areas by considering the impact on the customer and the need to improve.	When a team has identified more than one problem area to work on and it needs to reach consensus on which one is most urgent and important.
Problem statement	A way to summarize and express the findings (through Step 2) with clarity and objectivity. A good problem statement describes in specific, concrete terms what the data have shown. "This our problem."	To concisely communicate the issue at hand; for the team members, managers, supervisors, during presentations, etc.	A new problem statement is written for every problem-solving effort. As one bar in the Pareto Chart in Step 2 is reduced or eliminated, new statements are written to eliminate or reduce other bars.
Histogram	A visual representation of the spread or distribution of data. Data are represented by a series of bars with heights proportional to the frequency of occurrence.	Can give a good idea of how well our customers' specifications (valid requirements) are met. The information allows improved decision- making.	They can give us a good idea of how well we are meeting our customers' specifications (valid requirements). The information allows for improved decision making.
Cause and effect diagram (fishbone diagram)	A graphic composed of lines and words to represent a meaningful relationship between an effect and its causes.	The purpose is to identify suspected root causes of a problem.	It helps teams reach a common understanding of problems, exposes gaps in knowledge, directs teams towards actionable methods for reducing their problems, and is easy to use.
Action Plan	This plan catalogs all activities to be performed to ensure successful implementation of the countermeasures.	Plans include the practical methods to be used and any actions necessary to offset any remaining barriers.	In Step 4, as part of the countermeasure matrix.
Countermeasure matrix	A matrix of factors to help team members show the relationship among the problem statement, root causes and countermeasures.	Problem solving teams use it to ensure that countermeasures address the significant root causes of the problem.	Anytime a problem-solving team needs to identify countermeasures that will efficiently address the significant root causes of a problem.

More details are available on the CD-ROM.

The *Quality Toolbox* uses three questions to help program managers decide how to choose and apply tools at the appropriate times during the process of quality management[12,13].

1. **What does the team want to do with the tool?** Quality tools can be grouped according to what the team will do with them. Certain tools help a team come up with new ideas or organize many ideas. Others help in understanding a work process, discovering the cause of a problem, planning what to do, collecting and analyzing data, or evaluating how well you have done something. With time, the team will gain experience in cross-referencing the different ways to group the tools (since many have multiple uses) and will become quite proficient in their choice.

2. **At which step in the QI story is the team involved?** Table 2.22 presents a matrix that relates the use of the seven analytical tools to the QI story steps. Most are used in the first two steps, Reason for Improvement and Current Situation. Other process and planning tools facilitate the work of the team as they move through the seven steps. They are also described briefly in Table 2.21.

3. **Does the team need to expand or to focus its thinking?** The quality management process offers alternating exercises for expanding a team's thoughts on many different ideas or focusing its thoughts on specific ideas. In the expansion mode, the team generates new, creative, and innovative ideas. In the focus mode, the team narrows its thinking.

The process works like this. The team is confronted with many problems from which to choose i.e. indicators from graphs or checksheets. It uses focusing tools, such as the Pareto Chart, to decide which to choose. There are potentially many causes for the problem. It uses focusing tools, such as the fishbone diagram, to determine the root cause. The team proposes many solutions and then chooses which are most likely to work using the countermeasure matrix. The team uses the same indicators identified in QI Step 2 to evaluate whether the countermeasures were successful. With experience in using only a few tools, the team gains confidence in working together and is able to expand its own capabilities in the use of more tools.

TABLE 2.22
QUALITY TOOLS USED IN THE QI STEPS AND THEIR RELATIONSHIP TO THE PDCA CYCLE

	Most often used in which QI Step				
PCDA		**Plan**		**Do**	**Check and Act**
Tool	① **Reason for Improvement**	② **Current Situation**	③ **Analysis**	④ **Counter-measures**	⑤⑥⑦ **Results Standardization Future Plans**
Checksheet	X	X	X	X	X
Graph	X	X			X
Pareto chart	X	X			
Cause and effect diagram		X	X		X
Histogram	X		X		X
Scatter diagram	X	X			
Control chart					

PANEL 2.5
LESSON LEARNED

IMPROVING THE QUALITY OF OBSTETRIC SERVICES IN GUATEMALA



The Quality Assurance Project gives ten steps of quality design that have been developed to serve as guidelines for those involved in project design in developing countries at various health system levels, from community to national. The steps of quality design are:

1. Select the process to be designed;
2. Identify internal and external clients;
3. Identify and prioritize client needs and expectations;
4. Define the objective of the new design;
5. Create flowchart of main activities of process;
6. Link client needs with each activity on flowchart;
7. Identify key elements of new design that relate to priority client needs for each activity on the flowchart;
8. Describe the new process;
9. Error proof: test design for robustness and reliability; and
10. Plan, implement, and monitor new process.

These steps were applied in a project in rural Guatemala, where maternal mortality is estimated to be 190 per 100,000 births. Seven public hospitals set up quality assessment projects aiming to improve the quality of maternal care services, with the longer-term vision of reducing maternal mortality. Support was obtained from the hospital management, and a team was identified for each hospital. A 4-day training workshop for all team members gave an introduction to the quality-design steps and tools and allowed each team to select a process to be redesigned. Each of the hospitals identified a priority service to be improved such as triage of obstetric patients or obstetric surgery.

The teams met weekly for the next 5 months, working through the steps to redesign the chosen process. Client focus groups were part of the redesigning. Six of the seven teams completed their designs within nine months, resulting in improvements ranging from more privacy for women in labor, to a new theatre for obstetric emergencies. One team dropped out because of lack of support from hospital management.

The teams also identified several lessons learned that would improve the efficiency of other quality improvement process teams.

- Facilitators play a critical role in the design process and should be trained well in advance so that they know the methodology along with its weaknesses and limitations.
- Facilitators should clearly explain to team members what to expect (role within team, time commitment, budgetary limits, data monitoring)
- An achievable project should be selected first as an overlay ambitious selection of design can result in a long complex process that loses team momentum.
- Setting target dates for certain changes (benchmarking) reduces implementation time
- Possible hospital staff resistance should be anticipated and addressed in the change-management plan.
- Active support from hospital management should be encouraged by specifying what leadership can do and keeping leadership informed of progress.
- Training in the quality-design methodology should be reinforced when the teams reach steps 9 and 10 - error proofing and planning, implementing, and monitoring.

Source: USAID QAP/CORE/CSTS. Quality assurance of health care in developing countries. June 1999.

F. Capacity-building

Personnel are the chief resource in any program. The individuals who must make health care decisions and take appropriate action include pregnant women, their families, untrained community providers, trained birth attendants, nurses, nurse midwives, physicians, and program managers.

Each level of care requires a certain level of ability, generally achieved through training. In some cases, the training contains only information or promotion; in others, it contains full curricula and practice. For effective training to take place, special plans need to be made for each of the five components of training in Table 2.23.

TABLE 2.23
REQUIREMENTS OF EFFECTIVE TRAINING

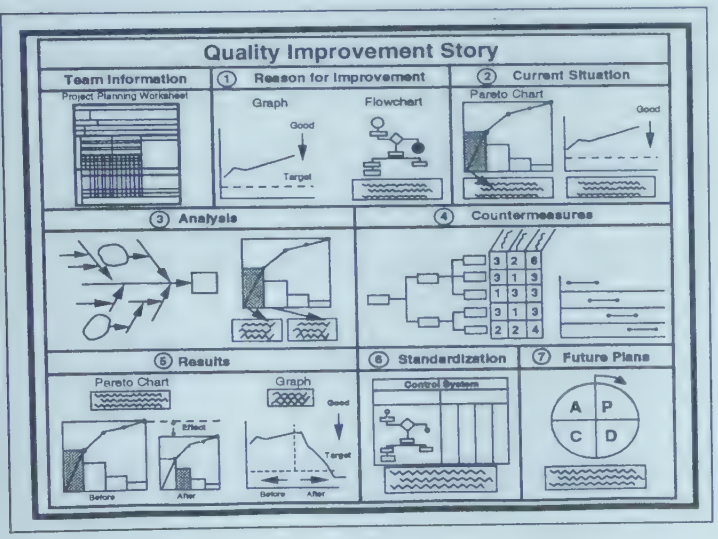
TRAINING COMPONENT	TASK
Needs assessment	Determine the categories and number of health personnel that exist. Conduct a performance assessment as described in Part two, Problem definition section.
Task analysis	What are the skills required to undertake a new technology or action? What specific knowledge and action sequences are needed to adequately perform a function. These needs form the content for training.
Design	Determine what task is to be performed by whom. Set the educational objectives, select the appropriate training methods, and determine how to evaluate training adequacy.
Development	Materials and training sessions must be at an appropriate level for the health care provider receiving training. Train-the-trainer materials may be necessary to support the training sessions. Development includes field testing.
Delivery	Locate facilities, supplies, and equipment as needed. Promote the availability of training or recruit trainees. In many cases, an infrastructure may need to be built at the district level to support the training.

SUMMARY OF QUALITY MANAGEMENT

Quality management is a process to ensure customer satisfaction through involvement of all employees in reliably producing and delivering quality products or services.

Quality management has three major components. The policy management component promotes a paradigm shift to modern tenets of management. Supervisors go from being inspector general to facilitator. Supervisors work for employees as much as employees work for supervisors. Teams improve the quality of products and services, develop skills and abilities of team members, promote communication and working together, and enhance quality of work life. Team development is an essential core of quality management. Quality in daily work is the primary job of quality teams, and it is everyone's responsibility.

Quality management has four fundamental principles. Patient satisfaction is achieved by promoting a client-centered orientation within organizations. At the root is management by fact. Decisions are made and actions carried out by translating data into information, not according to instinct, perceptions, or personal prejudices. Quality management uses the Plan-Do-Check-Act cycle as a simple model for its operation. The quality management's core value of respect for people achieves quality through full employee commitment and participation.



The QI story is a problem-solving process that is a systematic, data-based approach. Quality tools are used throughout the QI story steps. Eighty percent of problems can be solved with three analytical tools, 95 percent can be solved with seven tools (checksheet, Pareto chart, cause-and-effect diagram, graph, histogram, scatter diagram, control chart). Three questions help determine which tool to use. What does the team want to do with the tool? At which step in the QI story is the team? Does the team need to expand or to focus its thinking? The process goes through alternating exercises of expanding a team's thoughts on many different ideas or focusing its thoughts on specific ideas.

Training is a vital activity in quality management. The quality of the service provided is directly proportional to the amount of training staff receive. Lack of training provides poor quality in service, and poor quality in health services costs lives.

BEST READING

FOR PART TWO

A NEWBORN HEALTH INFORMATION SYSTEM

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Part

3

A Step-by-Step Approach: The Program Management Cycle



PART THREE



A Step-by-Step Approach: The Program Management Cycle

PAGE

Messages for Part Three 3.3

Terminology for Part Three 3.4

I. Principles for Step-by-Step Newborn Programming 3.5

A. General Principles for Newborn Health Programming 3.5
B. The Role of the Program Manager 3.6
C. The Role of the Stakeholders 3.7

II. A Step-by-Step Approach: The Program Management Cycle 3.10

Step 1. Define the Fetal-Neonatal Problem 3.11

A. What is a Problem? 3.13
B. How is a Problem Defined? 3.13
C. How Can Data/Information be Used to Define the Problem? 3.14
D. How Can the Key Stakeholders Participate in Defining the Problem? 3.26

Summary of Step 1 . . . . . 3.27

Step 2. Assess Performance of the Health Care Delivery System 3.29

A. Summary of Step 1 . . . . . 3.31
B. What is Performance Assessment? 3.31
C. How is Performance Assessment Done? 3.32
D. How Can the Key Stakeholders Participate in Performance Assessment? 3.38

Summary of Step 2 . . . . . 3.40

Step 3a. Prioritize Intervention Packages 3.41

A. Summary of Steps 1 and 2 . . . . . 3.43
B. What is Prioritization? 3.43
C. How to Prioritize Interventions 3.45
D. How Can Data/Information be used to Prioritize Interventions and Packages? 3.45
E. How Can Key Stakeholders Participate in Prioritization of Intervention Packages? 3.46

Summary of Step 3a 3.48

Step 3b. Implement Interventions 3.49

A. Summary of Steps 1, 2, and 3a 3.51
B. What is an Implementation Strategy? 3.51
C. How Can Data/Information be used to Implement Interventions? 3.52
D. What are the Key Strategies for Implementing Interventions? 3.55

Summary of Step 3b 3.68

Step 4. Monitor Progress and Evaluate Outcomes **3.69**

A. Summary of Steps 1, 2, 3a, and 3b 3.71
B. What are Monitoring and Evaluation? 3.72
C. From Global to Local Indicators 3.73
D. How to Select Indicators in the Local HMIS 3.75
E. How Can Information be Used to Monitor and Evaluate Newborn Programming? 3.79

Summary of Step 4 ..... 3.83

III. Summary: Step-by-Step **3.84**

"Bring it All Together" Summary of Tools Used in Step-by-Step Approach 3.88

A. Using BABIES Matrix to Identify Problems and Focus on the Interventions 3.88
B. Using the Health Fishbone and Countermeasure Matrix to Develop an Action Plan 3.88
C. Using the Management Fishbone and Countermeasure Matrix for Monitoring and Evaluating the Interventions 3.91



MESSAGES FOR PART THREE

1. Recognize the principles for applying the step-by-step approach in the program management cycle, including:

   - general principles for newborn health programming;
   - the role of the program manager; and
   - the role of the stakeholders and how to involve them.

2. Understand Step 1 (how to define the problem for fetal-neonatal health in the local setting, systematically review data, and involve key stakeholders).

3. Understand Step 2 (how to organize a performance assessment for the health care delivery system, use data, and involve key stakeholders).

4. Understand Step 3 (how to prioritize the intervention(s) that will be most effective and feasible in the local setting and implement these to best meet the local needs).

5. Understand Step 4 (how to distinguish between monitoring and evaluation, including their focus, types of data collection, analysis, and timing).

6. Appreciate that the four-step program management cycle, the Health Care Delivery System (HCDS), and the Health Management Information System (HMIS) contribute to ongoing program improvement.



TERMINOLOGY FOR PART THREE

Health care delivery system (HCDS):

The HCDS includes all people who provide and receive health services. These individuals can be categorized in three sectors:

- the community/informal sector;
- the intersectoral sector; and
- the formal health care sector.

All three sectors play a vital role in making and implementing decisions in the program management cycle.

Health management information system (HMIS): The HMIS is used to collect and analyze key data. It allows the program manager(s) and stakeholders to better organize their data and to transform the data into useful information for decision-making and effective management.

Program management cycle (a step-by-step process): The program management cycle is a four-step process that assists the program manager and key stakeholders to:

1. identify the key problem(s) in their setting;
2. assess performance of the HCDS;
3a. prioritize interventions;
3b. implement appropriate interventions; and
4. monitor progress and evaluate outcomes.

Program manager(s): This individual may be any of the following:

- the District or Regional Medical Officer;
- the program/project manager of a local or international nongovernmental organization; and
- the manager of Safe Motherhood/reproductive health or Child Survival programs.

Stakeholder(s): Stakeholders are people who either make decisions or influence decision making in the informal/community, intersectoral, and formal sectors of the HCDS.

I. PRINCIPLES FOR A STEP-BY-STEP APPROACH TO NEWBORN PROGRAMMING

PROGRAMMING PRINCIPLES FOR NEWBORN HEALTH

- **PRINCIPLE 1**
  Rights of the mother *and* baby.
- **PRINCIPLE 2**
  A systems approach involving the health care delivery system.
- **PRINCIPLE 3**
  Adaptable health management information system.
- **PRINCIPLE 4**
  A step-by-step approach: the program management cycle.

A. General Principles for Newborn Health Programming

The general principles for improving maternal and fetal-neonatal outcomes are outlined in the Introduction. This section describes how the program management cycle can be used to put these principles into practice systematically to improve newborn survival in the local setting area.

PRINCIPLE 1: Rights of the mother *and* baby

The main goal is to improve the survival and health of newborns and women in the local setting. Even if women have low status and newborns may not be considered fully a person, they have rights as human beings. Their value and the fact that newborn and maternal outcomes can and must be improved is the motivation for newborn programming.

PRINCIPLE 2: A systems approach involving the health care delivery system (HCDS)

Fetal-neonatal deaths result from a complex combination of interrelated social and medical causes, and no single intervention can adequately address this problem. The goal is to strengthen the local system, not simply to build a parallel system for a separate program. The HCDS includes all people who provide and receive health services. These individuals can be categorized into three main sectors presented below.

Informal/community sector: Individuals, households, and the community (including traditional providers).

Intersectoral sector: Members of the intersectoral sector who may reside in the community (i.e., teachers, development committees, transportation workers).

Formal health care sector: All health institutions and personnel (including private, missionary, and government sectors).

Because many maternal and fetal-neonatal deaths occur in the community, solutions cannot lie solely in the formal health care sector. In fact, both the community and the intersectoral sectors (transport, education, schooling, etc.) play a vital role in improving fetal-neonatal and maternal outcomes. The needs of the mother and the fetus or neonate may change rapidly, thus making recognition and response to danger signs crucial. The program management cycle allows program managers and stakeholders to identify strengths and weaknesses at all levels of the local system. It also allows the program manager to maximize access to quality health services for women and their newborns.

PRINCIPLE 3: Adaptable health management information system (HMIS)

The HMIS is a basic system for collecting and analyzing key data. Use of this system allows the program managers and stakeholders to better organize data and to transform it into useful information. It is crucial for the program manager to use information for decision-making in all four steps of the program management cycle and at all levels of the health system.

PRINCIPLE 4: A step-by-step approach: the program management cycle

There are four steps in the program management cycle;

1. define the fetal-neonatal health problem;
2. assess performance of the HCDS;
3a. prioritize interventions;
3b. implement interventions; and
4. monitor progress and evaluate outcomes.

Input, participation, discussion of perceptions and resources, and implementation from all sectors is essential for the HCDS to reach its greatest potential. In each step, the potential roles for each sector in the HCDS are identified.

B. The Role of the Program Manager

As outlined in the Introduction, many individuals are included under the title "program manager." It may refer to the following individuals:

- the District or Regional Medical Officer;
- the program/project manager of a local or international non-governmental organization; and
- the manager of Safe Motherhood/reproductive health or Child Survival programs.

This list, though not exhaustive, indicates that the target for this information is the program implementers. Although program managers may have slightly different roles, they all need to make programmatic decisions.

The overall role of the program manager is to facilitate the provision of quality information and services to a population to achieve the highest possible level of health. No one person can do this alone; thus partnership is key. That is why a comprehensive view of the HCDS is emphasized throughout the manual. All the sectors of the HCDS - community, intersectoral and formal sectors - have a vital role to play in improving the helath status of the populations.

C. The Role of the Stakeholders

The program manager must answer three questions to develop a plan to involve the stakeholders.

Who are the key stakeholders?
What is the purpose of involving each stakeholder group?
How can the key stakeholders be identified and involved?

Who is a stakeholder? In general terms, a stakeholder is an individual or a group who has an interest or a stake in achieving the desired objectives. In simpler terms, they are the key people that make or influence decision-making in the informal/community, intersectoral, and formal sectors of the HCDS. Thus, it is important to identify the key stakeholders in all sectors.

There are many stakeholders in various areas of decision-making and/or areas of influence (Table 3.1). The stakeholders can be identified formally or informally. Formally, the program manager could ask the Ministry of Health (MOH) who the District Medical Officer is or ask the Ministry of Transportation who the head of the transportation department is. These are official and permanent positions even though the personnel may rotate; the information is usually available to the public. Identifying stakeholders informally is more difficult. These stakeholders are known to the community and may include village chiefs, women's groups, or traditional birth attendants (TBAs). By asking people or NGOs in the community, the program manager could identify key stakeholders. Participatory tools, such as mapping pattern of service use, may also help in identifying the stakeholders.

Why involve stakeholders? In many communities with high rates of fetal-neonatal, and maternal mortality, other social, economic, and health problems may be perceived as more important to the community. Sometimes people may feel that no problem exists. For example, people may believe that it is normal for neonates to die, and there is nothing they can do about it. Raising consciousness of how healthy mothers and babies contribute to the community's overall well-being may be the first major step.

There are four main reasons for involving stakeholders in every step of the program management cycle:

- developing broad ownership of the problem;
- identifying existing resources available to address the problem;
- motivating collective action based on the strengths of the various partners; and
- design interventions and strategies that reflect the local needs (i.e., respect of local culture) to foster sustainability.

How to involve stakeholders? To involve the stakeholders actively in the process, the program manager must prioritize which groups are the most critical in terms of fetal-neonatal health. There might be a small core group that meets more frequently and a large group that meets less frequently, but it is essential to foster ownership among all groups of the problem and its solutions.

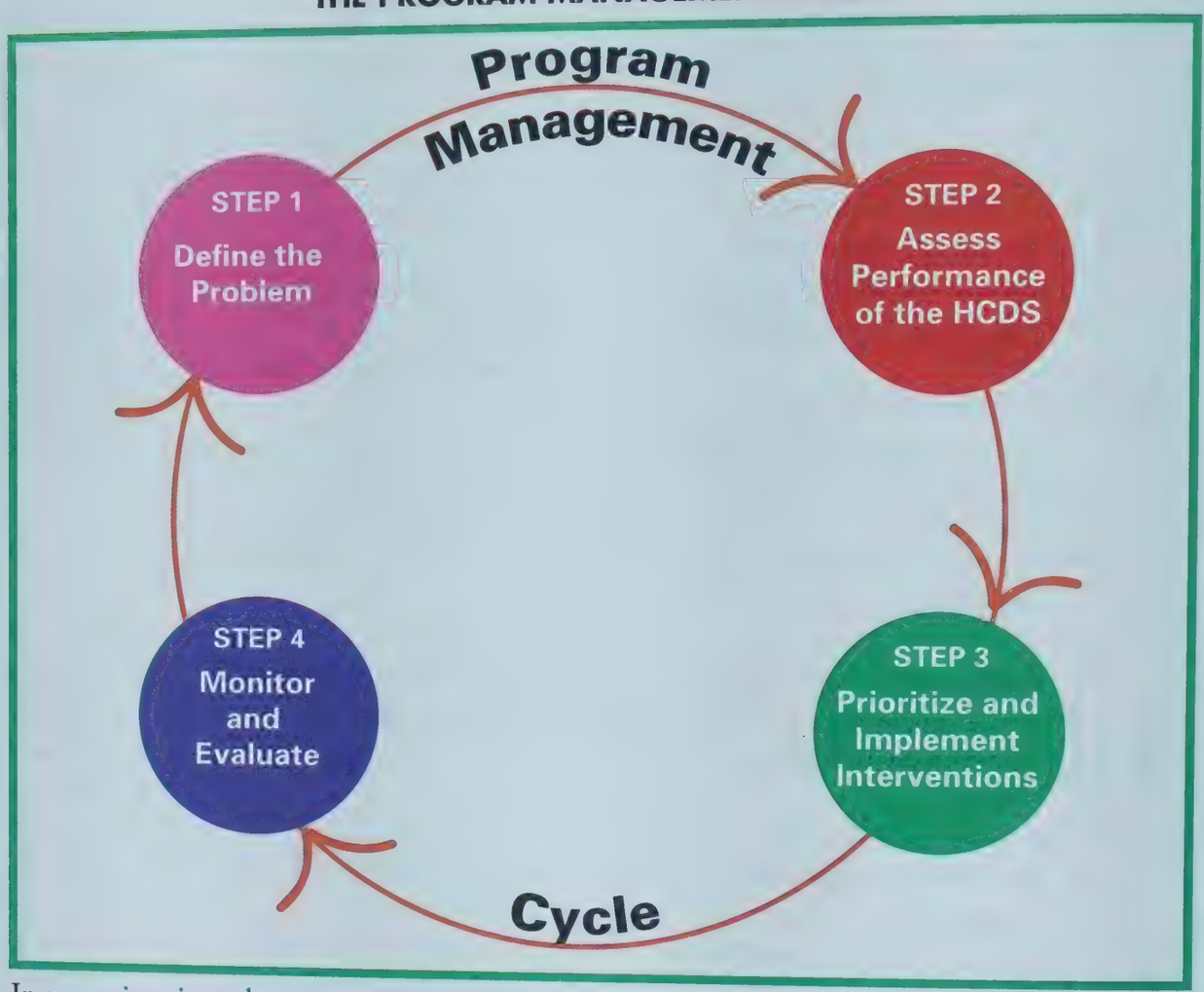
TABLE 3.1
EXAMPLES OF KEY STAKEHOLDERS BY SECTOR

	INFORMAL/COMMUNITY	INTERSECTORAL	FORMAL
WHO?	• Village and religious leaders. • Women's group leaders. • Health providers (TBAs, village doctors). Note: Women are often minimally represented in local/community decision-making bodies.	• Teachers. • Local development boards. • Transportation department.	• Nurses and midwives. • Doctors in clinical service (including private practice). • District/regional medical officers. • Other national MOH staff. • Academic medical staff, if appropriate. • NGOs and others active in formal health care provision.
WHY?	• To include client viewpoints on the problem and the current performance of the system for fetal-neonatal health. • To promote ownership of the problem and the potential solutions within the community. • To mobilize community resources.	• To mobilize resources (i.e., transport, development funds, communications, education). • Involvement may influence policy.	• To understand staff perceptions (positive or negative). • To promote ownership of the problem and the potential solutions. • To access and improve the data available.
HOW?	• Community-wide meetings. • Focus group discussions. • Community mapping.	• Community-wide meetings. • Focus group discussions.	• Collection and presentation of data. • Discussion meetings. • Participation in audits.
CHALLENGES?	• May not perceive as a problem (lack of knowledge, gender difference in perception, newborn not valued). • Traditional practices. • Mistrust of formal health system. • Cost/lack of resources.	• Not traditionally included in these sectors. • Poor communication/ lack of established relationship.	• Limited number of technical, competent staff. • Underpaid, poor motivation. • Negative attitudes.

II. A STEP-BY-STEP APPROACH: THE PROGRAM MANAGEMENT CYCLE

This section provides a more detailed description of the program management cycle for establishing or refocusing a program to address fetal-neonatal health. The aim is to enable the program manager and key stakeholders to make better decisions about fetal-neonatal and maternal health programming. This section is organized by the four steps of the program management cycle (Figure 3.1).

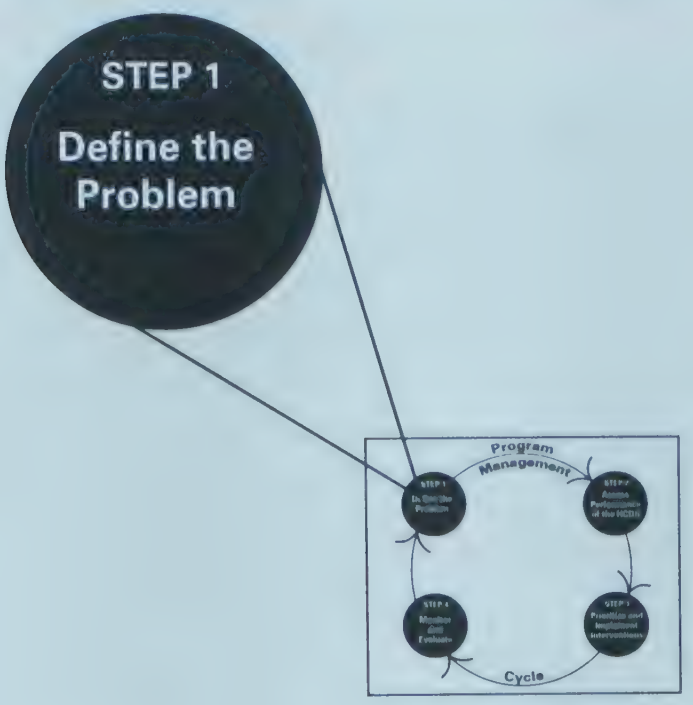
FIGURE 3.1
THE PROGRAM MANAGEMENT CYCLE



In most situations the program manager will begin the cycle at Step 1: (problem definition) and proceed in a clockwise manner, through assessing performance, prioritizing and implementing interventions, and monitoring and evaluating results. However, one of the advantages of the cycle is that a program manager can start anywhere.

For purposes of explanation, the problem definition will be the first step here. This step-by-step approach allows the key problems to be identified and an intervention to be designed to address the key newborn health issues in the local setting. For each step, there is an explanation of how to use information for decision-making and how to involve the stakeholders. A descriptions of tools that may be useful at each step is also provided. Additional details on tools are provided on the attached CD-ROM. This cyclic approach allows the program manager to go through the steps of the program management cycle again and again, continuously building on improvements to strengthen the local HCDS.

STEP 1 DEFINE THE FETAL-NEONATAL HEALTH PROBLEM



A. What is a Problem?

B. How is a Problem Defined?

C. How Can Data/Information be Used to Define the Problem?

Action 1. Collect and examine data.
Action 2. Compare the local data with a standard population.
Action 3. Understand the "Opportunity Gap" in the local setting.
Action 4. Identify the key problems to be assessed in Step 2.

D. How Can Key Stakeholders Participate in Defining the Problem?

Summary of Step 1



TERMINOLOGY FOR PART THREE

STEP ONE

Age at death: Age at time of death of fetus or neonate.

Attributable risk: A measure of the amount of the health outcome (i.e., newborn deaths) that can be attributed to a specific problem (i.e., neonatal tetanus).

BABIES (Birth weight and Age at death Boxes for an Information and Evaluation System): An assessment tool that allows a program manager to organize data on newborn health.

Birth weight group: Category of birth weight; may be divided into categories (i.e., less than 1.5 kg, 1.5 kg to 2.5 kg, greater than 2.5 kg) or may be assessed in terms of small and normal.

Fetal death rate: $\frac{\text{Death among fetus aged 22-40 weeks}}{\text{Number of total births (stillbirths and live births)}} \times 1{,}000$

Fishbone diagram: This is often called the "But Why" diagram. This diagram helps to identify the problem and its underlying causes by asking a series of "But Why " questions to each response.

Incidence: The number of new cases divided by the total number of cases (both old and new).

Low Birth Weight (LBW) Rate: $\frac{\text{Death among LBW babies aged 0-28 days}}{\text{Number of LBW babies}} \times 1{,}000$

Neonatal mortality rate: $\frac{\text{Deaths of babies aged 0-28 days}}{\text{Number of Live Births}} \times 1{,}000$

Opportunity Gap: The difference between health indicators in an appropriate standard population and those in the population of the project setting.

Prevalence: The existing cases divided by the total number of cases (both old and new).

Problem: A gap between the way something is and the way we want it to be.

Relative risk: The ratio of the risk of disease or death among those exposed to the risk compared to the risk among the unexposed; this usage is synonymous with risk ratio.

Standard population: A reference group used for comparison. Appropriate standard populations may be external, national, or internal.

Verbal autopsy: A standardized tool to determine the likely cause of death by discussion with family and community members after the death.

A. What is a Problem?

Problems may or may not exist, depending on the perceptions of decision-makers, health providers, and the broader community. Often cultural beliefs, traditions, education, and, especially, the lack of data may inhibit recognition of a problem. If no one thinks or perceives that a problem exists, then it does not exist as a problem in the minds of the health staff or communities. If the epidemiological data show that there is a problem, but there is no community concern about this issue, raising awareness may be the first step.

> A health problem must be defined both epidemiologically and from the community's perspective.

A health problem is the difference or gap between what is observed (what is the reality in the local setting?) and what the selected standard population (what are the global or national figures?) has realized in terms of mortality or morbidity. Focusing on these gaps can help the program manager and stakeholders prioritize problems.

> A **PROBLEM** is a **GAP** between the way something is and the way we want it to be.

B. How is a Problem Defined?

Health problems need to be defined from both an epidemiological perspective (is there and excess of fetal-neonatal deaths?) and a community perspective (does the community consider fetal-neonatal deaths to be a problem?). Interventions based exclusively on either community concerns or epidemiological findings will not be effective in the long-term. Actual measurement of the magnitude of problems is needed to support feelings or opinions about major health issues within a specific population. Along with an examination of the medical causes of fetal-neonatal deaths, an assessment of the underlying cultural, social, and behavioral causes is also required.

The program manager may encounter many challenges, which may include multiple health and social problems, inadequate resources, and preset agendas by distant decision-makers.

Step 1 outlines how a program manager would collect and assess the data from the three sectors (informal/community, intersectoral, and formal) of the HCDS.

The aim of Step 1 is to achieve consensus among the program manager and key stakeholders as to whether newborn health is a problem and, if so, to identify the key local problems for newborn health.

- Is fetal-neonatal health a priority problem in the local setting?
- How much of a problem is there? ("Opportunity Gap")?
- To whom, where, and when does the "Opportunity Gap" occur?
- What areas of the HCDS need to be assessed for performance in Step 2?

C. How Can Data/Information Be Used to Define the Problem?

A program manager can only manager what they can count. Data and information are essential for good management.

> Without data, you are just another person with an opinion.

The program manager and key stakeholders need to identify and examine the epidemiological data that already exist in their setting (i.e., birth weight, diagnosis based on clinical factors). Unfortunately, in many settings, very limited data are recorded about maternal and fetal-neonatal deaths. Most data are from health institutions, where many, if not most, maternal and fetal-neonatal deaths occur in the communities, where they are rarely recorded. Defining fetal-neonatal health problems in a given setting with little information requires a realistic, innovative, and cooperative approach. Although reliable data are scarce, some data are available in most countries. Unfortunately, the data available are not often used to identify and address the current situation for newborn health. Existing data can be helpful as long as their limitations are taken into account.

Four main actions are involved in collecting and transforming data into information to define a problem for newborn health (Table 3.2).

Step 1 – Action 1. Collect and examine data.
Step 1 – Action 2. Compare local data to a standard population.
Step 1 – Action 3. Understand the "Opportunity Gap."
Step 1 – Action 4. Identify key problems to be assessed further in Step 2.

STEP 1 – ACTION 1. Collect and Examine Data

There are three actions for collecting and examining data:

Task 1.1 Review existing data
Task 1.2 Collect key pieces of additional data
Task 1.3 Change numbers into rates

STEP 1 – ACTION 1.

TASK 1.1 Review Existing Data

The first step is to have the stakeholders review the existing data (i.e., maternal, fetal-neonatal deaths). If possible, the data are collected from all HCDS sectors. Existing data are useful, but it is important to understand their limitations. For example, if hospital-based data are being used, it would be important to know approximately what percentage of deliveries are in hospitals. Also, are the women who deliver in a hospital of higher social status, are they at greater risk, or both? For example, using hospital-based data to estimate the LBW may result in an underestimate of only those women who delivery in institutions, or maybe an overestimate if many of the births in institutions are complicated deliveries. This information helps to assess whether the data are representative of the entire community.

TABLE 3.2
ACTIONS FOR IDENTIFYING THE PROBLEM FOR NEWBORN HEALTH

ACTION	TASK	COMMENT
Step 1 – Action 1: Collect and examine data.		
	Task 1.1: Review existing data.	Collect data from institutions, health service statistics, community records, vital registration, etc. The data can be collected by cause of death. Use the BABIES matrix to further investigate the cause of death.
	Task 1.2: Collect key pieces of additional data.	Depending on the cause, collect more data to examine the problem.
	Task 1.3: Change numbers into rates.	Use the correct denominator for the data collected (or estimated denominator) to calculate basic rates, including: • late neonatal mortality rate; • low birth weight rate; • mortality rate for each cell of BABIES; and • mortality rate of reach cause of death.
Step 1 – Action 2: Compare local data to a standard population.		
	Task 2.1: Select a standard population for comparison *Task 2.2:* Compare local data to the standard to identify the "Opportunity Gap." *Task 2.3:* Compare local population with a standard using BABIES.	Standard population may be: 1) external, 2) national, or 3) internal. Once the standard population is identified, the BABIES matrix for the standard population can be compared to the local BABIES matrix to identify the "Opportunity Gap." In many settings, there will be excessive mortality for most causes of death/cells of BABIES, especially if an external standard is used.
Step 1 – Action 3: Understand the "Opportunity Gap."		
	Task 3.1: Describe the "Opportunity Gap" according to who is affected, where, and why. Task 3.2: Examine the root causes.	If a particular cause of death (i.e., neonatal tetanus) or cell of BABIES has an obviously large "Opportunity Gap," collect more data to see who is affected, where, and why. Further examine the root causes for the identified "Opportunity Gap." For example, are traditional practices related?
Step 1 – Action 4: Identify key problems to be assessed further in Step 2.		
	Task 4.1: Come to a consensus with the key stakeholders about a problem that is a priority from an epidemiological and community perspective.	The problem may be a specific cause of death or one category of BABIES, including: • pre-pregnancy health; • care during pregnancy; • care during delivery; and

The key pieces of information recorded in these documents include:

- for each death:
  - number of fetal and neonatal deaths;
  - time of death (fetal, neonatal);
  - cause of death, if available;
  - birth weight group (i.e., small, normal);
- newborn morbidity data, if available; and
- maternal deaths (numbers and causes).

Table 3.3 provides some examples of sources of existing data.

TABLE 3.3
SOURCES OF EXISTING DATA ON FETAL-NEONATAL HEALTH PROBLEMS

Institutional	**Civil registration**
Delivery room logbooks.	Birth registration.
Newborn ward logbooks.	Fetal-neonatal death registration.
Birth and death registers.	Maternal death registration.
Obstetric theater records (# of C-sections).	**Community level (less available)**
Fetal-neonatal/pediatric admission records.	Records of village health workers.
	Records of outreach clinics.
District, regional level or national level	Surveys (i.e., Demographic Health Survey).
Health reports.	

Source: Measure.

If the BABIES assessment tool (described in Part Two) is used, only two pieces of data are required initially (age at death and birth weight group). Reviewing the data in this manner allows the program manager and key stakeholders to record the magnitude of the situation and to prioritize other data to be collected.

Once the existing data are gathered and reviewed, it can be examined in many different ways. For purposes of this manual, two approaches are discussed below.

Cause of death data: The data can be reviewed by examining the cause(s) of death. This process would entail identifying the main clinical diagnosis, for example, neonatal tetanus. This information may be found in the logbook, case notes, or on the death certificate, if one exists.

BABIES matrix: The BABIES matrix can be used to help the program manager understand the distribution of the deaths. For example, are more small birth weight babies dying in comparisons to normal birth weight babies? It also helps to identify when the newborns are dying, such as during the first 24 hours after delivery. Cause of death can also be examined once the primary assessment using the matrix is done.

If cause of death data are available and reasonably reliable, the program managers can:

- use the cause of death data;
- use the BABIES matrix; or
- use some combination of the two approaches.

However, in many settings, including developed countries, the cause of death data may not be reliable because of the difficulties in differentiating between clinical conditions. Using the BABIES matrix to examine the existing data allows the program manager to target the problem by time period and birth weight group.

STEP 1 - ACTION 1.

TASK 1.2 Collect Key Pieces of Additional Data

Because existing data are usually very limited, additional data, both qualitative and quantitative, will likely need to be collected. The purpose of collecting more data is to further the understanding of the process. The program manager and stakeholders should be selective in choosing the data to be collected. The data should be targeted to answer specific questions in order to make decisions. Collecting data that will not be used wastes time and money. Some suggested additional data are listed in Table 3.4.

TABLE 3.4
METHODS FOR COLLECTING ADDITIONAL TARGETED DATA TO DEFINE THE PROBLEM

TOOL OR METHOD	KEY INFORMATION COLLECTED
Quantitative surveys.	Identify women of reproductive age and record outcomes of pregnancies and other characteristics/behaviors of the women.
Focus groups.	Identification and prioritization of problems by gender, age, etc.
Venn diagramming.	Subjective quantification of size of specific problems or performance of HCDS.
Verbal autopsies of fetal-neonatal deaths or near deaths.	More specific information as to cause of death (i.e., delay in access to care).
Flow charts for perceived causation.	Community perceptions of causation.
Historical timeline.	Variation of outcomes, risk factors, or resources with time.
Seasonality calendars.	Variation of activities, resources, coping strategies, outcomes, and risk factors with seasons.
Fishbone diagram.	To identify the root cause of the problem.

Source: WHO/CDS,CSR.

STEP 1 - ACTION 1

TASK 1.3 Change Numbers Into Rates

Before the data can be meaningfully compared, the raw numbers need to be assessed in relation to the total population in the area. This involves changing the raw data into a rate.

TABLE 3.5
REASONS FOR USING RATES

In area A, there are 100 infant deaths among 20,000 live births. Thus, the infant mortality rate is five per 1,000 live births (100/20,000).

In area B, there are 100 infant deaths among 100,000 live births. The rate for this population is much lower at one per 1,000 live births (100/100,000).

Looking just at the raw numbers –100 infant deaths – one could make the mistake of thinking that the problems are about the same. However, when the rates are calculated, one can see that the problem is five times worse in Area A.

To calculate a rate, the program manager needs to know (or estimate) the population (i.e., total births); this value is the **denominator.** The number of events (i.e., neonatal deaths) is the **numerator.** If the data are collected at an institution, the denominator will be the number of births in the institution (total births for fetal or perinatal rates and live births for neonatal rates). In many settings, the denominator may not be known, especially if the data are collected at the community level. One solution to this problem is to estimate the denominator (discussed in the epidemiology section in Part Two).

Although there are many possible rates, the most important for neonatal health are (the formulas are given with the terminology for Part One):

- late fetal death rate (stillbirths);
- neonatal mortality rate (ideally split by early and late); and
- LBW rate.

Looking at rates may indicate the reliability of the data. If the LBW rate is high (greater than 15%) in a setting with no neonatal intensive care facilities, one would expect to have a high NMR (greater than 20 per 1,000 live births). If the LBW rate and the neonatal mortality rae is not very high, it may be that the data do not include LBW babies. In fact, these babies may not have been counted at all.

One can also look at the ratio of the late fetal deaths (22 weeks gestation) to early neonatal deaths (0-7 days of life). This ratio should be approximately 1-to-1 (i.e., the number of late fetal deaths should be approximately the same as the number of early neonatal deaths). If there is a great disparity with few fetal deaths, fetal deaths were probably not accurately counted in the data. If the data are reliable and there are more stillbirths than early neonatal deaths, there may be a particular cause of stillbirths, such as high incidence of maternal syphilis.

Even if the data are missing certain groups of babies (fetal deaths or LBW are the most common), some data are better than none. However, it is important to remember the limitations when using the data for decision-making.

STEP 1 – ACTION 2. Compare Local Data with a Standard Population

After examining the data, the program manager may think that a problem exists. However, the program manager cannot be sure unless the local data are compared to a standard population. This involves three tasks:

Task 2.1 selecting a standard population for comparison;
Task 2.2 comparing local data to a standard population to identify the "Opportunity Gap" (the largest gap between local and standard data); and
Task 2.3 comparing local population with a standard using BABIES.

The difference in rates (mortality and/or morbidity) between the selected standard population and the local population is a ***"gap"*** in health status. If the selected population has a better health status than the local population, this difference provides an ***"opportunity"*** for the local population to improve its health status.

An ***"opportunity"*** exists to enhance "fairness among the population" (i.e., improved access to services among marginalized groups) and reduce the ***"gap"*** in health status. In many situations, a large portion of the "Opportunity Gap" may be concentrated in one subpopulation (i.e., LBW babies, adolescent mothers) or with one specific cause of death (i.e., infection) that can be effectively targeted. To see if an "Opportunity Gap" exists, the program manager needs to select an appropriate standard population for comparison. The underlying question particularly for the internal standard is, If someone else has already done it, why can't we do it?

TABLE 3.6
USING A STANDARD POPULATION TO DETERMINE WHETHER THERE IS A PROBLEM

If the neonatal mortality rate (NMR) in the district is 100 per 1,000 live births, you will not know if this is a problem, unless you compare this to a standard. If the NMR in Sweden is 3 per 1,000 live births, the "Opportunity Gap" is 97 per 1,000 live births (100-3).

It might be that Sweden is not the most suitable standard because of the difference in development resources. If data from the capital city of your country (selected standard population) shows that the NMR is 50 per 1,000 live births, the "Opportunity Gap" is at least 50 (100-50). Thus, a problem exists.

STEP 1 - ACTION 2.

TASK 2.1 Select a Standard Population for Comparison

There are three choices (Table 3.7):

- external standard (i.e., Sweden);
- national standard (i.e., subpopulation in capital city); and
- internal subpopulation standard within a geographical area (i.e., subpopulation in regional town or city).

TABLE 3.7
CHOICES OF A STANDARD POPULATION TO DEFINE THE "OPPORTUNITY GAP"

	EXTERNAL	NATIONAL	INTERNAL
Strengths	Data most readily available, usually a developed country. Describes the equity gap between countries.	Usually most acceptable (within the same country). Can be used to identify the equity gap within a country.	May be the most appropriate. May be the best means of identifying high-risk populations requiring intervention.
Limitations	Objections to using this standard arise because of the inequities in resources between countries (unattainable goals).	Usually represents data from socioeconomically advantaged populations in the country (may not be accepted by other groups).	Limited availability of data. Program manager may not have the skills or resources to collect these data.

The types of standards are discussed in more detail in Part Two.

STEP 1 - ACTION 2.

TASK 2.2 Compare Local Data to a Standard Population

After the standard population is selected, the program manager can proceed with the epidemiological analysis. To do this, the local data are converted into a rate and compared with the chosen standard rate.

STEP 1 - ACTION 2.

TASK 2.3 Compare Local Population with a Standard using BABIES

Part Two described how to use BABIES to define the "Opportunity Gap." In summary, the actions are as follows:

1. adapt the matrix to the local setting. Decide how BABIES would work best in the local setting in terms of how many rows (birth weight group) and how many columns (age at death) are needed;
2. collect data and plot the deaths into the matrix by age at death and birth weight group;
3. calculate the rates for each cell by dividing the number in each cell by the total births;
4. select a standard population; and
5. calculate the "Opportunity Gap." Compare the rate for each cell or group of cells with the rates of the standard population to determine which cells have an excess mortality, or "Opportunity Gap."

STEP 1 – ACTION 3. Understand the "Opportunity Gap"

For many settings in developing countries, there will be an "Opportunity Gap" for many of the cells in the BABIES matrix. The group of cells within the BABIES matrix with the biggest gap is not necessarily the key area in which to intervene. The "Opportunity Gap" needs to be examined further to:

- describe the "Opportunity Gap" according to who is affected, when, and why; and
- understand the underlying causes contributing to fetal-neonatal deaths.

STEP 1 - ACTION 3.

TASK 3.1 Describe the "Opportunity Gap" According to Time, Person, Place

It is important to identify whether:

- a particular group of babies or mothers is at risk (who?);
- babies in a certain location are at risk (where?);
- the condition changes with time, such as seasonal changes (when?); and
- there are obvious risk factors, such as harmful traditional practice (why?).

To refine understanding of the "Opportunity Gap," several pieces of additional data are needed. This issue is discussed further in Part Two under epidemiology and BABIES. Table 3.8 outlines the key questions to ask and the key pieces of required data.

TABLE 3.8
QUESTIONS TO FURTHER UNDERSTAND THE "OPPORTUNITY GAP"

	QUESTION	DATA TO BE COLLECTED	POSSIBLE DATA COLLECTION METHOD
WHO?	**Who is affected?** Compare different groups of people.	Personal characteristics such as: • Socioeconomic status. • Education. • Ethnicity.	Village health worker records. Community-based surveys. Verbal autopsies. Hospital records.
WHERE?	**Where do they die?** Compare by geographical location.	One village/region compared to another. Home compared to hospital. Type of facility.	Maternity/labor logbook and inpatient records. Community-based survey. Death certificates if these are reliable locally.
WHEN?	**When do they die?** Compare changes over time (i.e., years, seasons).	Number of deaths per month, year.	Community monitoring board or other adaptations of BABIES. Village health worker records. Verbal autopsies in the community. Hospital records. Regional records, i.e., for tetanus if this is reported.
CAUSE?	**What is the cause?** Identify specific medical causes, if this information is available.	Causes of death, such as: • Asphyxia. • Infections, such as tetanus or sepsis. • Jaundice. • Birth defects.	Verbal autopsies in the community. Institutional data on cause of death. BABIES can direct the program manager to a particular cell where certain causes are more likely. This allows the program manager to focus attention on examining these causes.
WHY?	**Why are they affected?** (Root cause) Identify underlying risk factors.	Age of mother/parity/birth interval. Harmful traditional practices.	Analysis of existing data, i.e., from hospital records. Verbal autopsies. Focus groups of health care staff and community members.

STEP 1 - ACTION 3.

TASK 3.2 Understand the Underlying Causes Contributing to Fetal-Neonatal Deaths

Many fetal-neonatal deaths involve social, environmental, and economic causes, such as harmful traditional practices, lack of transportation, or lack of resources. All of the causes need to be identified. Since sick newborns may die if not treated quickly, it is important to identify the key barriers contributing to lack of access to care.

There are four main delays that inhibit pregnant women and newborns from accessing services in a timely manner:

- ***Delay #1: Delay in problem recognition;***
- ***Delay #2: Delay in deciding to seek care;***
- ***Delay #3: Delay in reaching the health facility; and***
- ***Delay #4: Delay in receiving quality treatment at the health facility.***

These delays are discussed in Part One and potential solutions are discussed in Part Four.

A useful tool to examine the underlying causes of a problem is the fishbone diagram, also called the "But why?" diagram. To complete a fishbone diagram, a program manager can follow these four stages (described in Part Two).

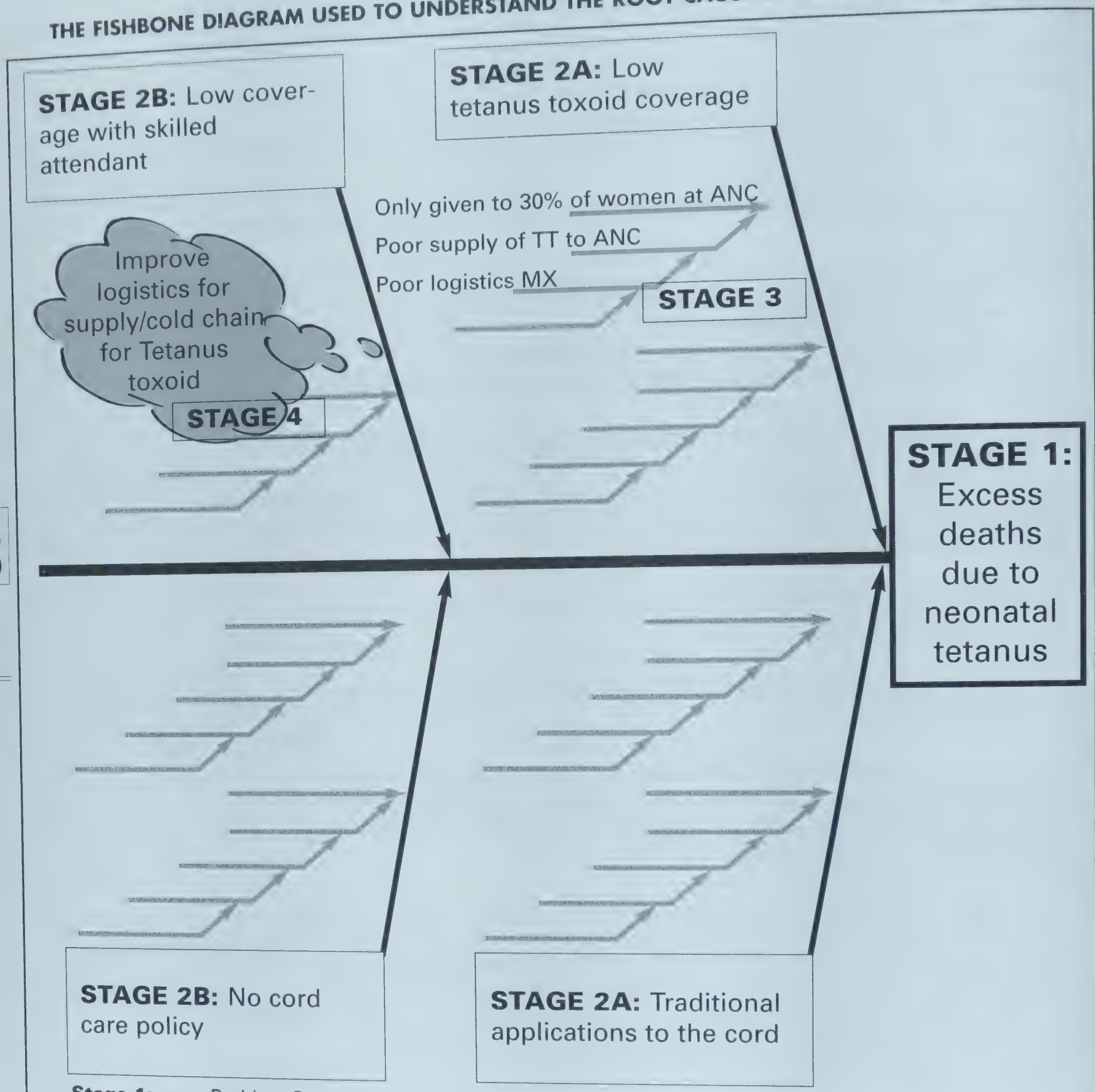
Stage 1 – Problem Statement: The identified problem is put at the "head" of the fish (Figure 3.2).

Stage 2 – Identify the Underlying Causes: The underlying causes are put into the four boxes.

Stage 3 – Ask "But Why" to Identify Root Causes: Questions are a method of performance assessment which will be discussed in Step 2 in more detail. Answers require examination of quantitative or qualitative data, or they may be common knowledge (i.e., a given traditional practice).

Stage 4 – Identify Potential Interventions: At any point, if a problem is identified as having an actionable solution, the solution can be marked next to the fishbone, as presented in Figure 3.2. Once actionable steps/interventions are identified, then current performance of these services can be assessed in Step 2. The actionable step/intervention can also be inserted into the head of the counter measure matrix to assess the feasibility, as described in Part 2.

FIGURE 3.2
THE FISHBONE DIAGRAM USED TO UNDERSTAND THE ROOT CAUSE OF NEONATAL TETANUS



Stage 1: Problem Statement.
Stage 2a-B: Identify Underlying Causes.
Stage 3: Fishbone "But Why" to identify Root Causes.
Stage 4: Identify Potential Interventions.

STEP 1 – ACTION 4. Identify the Key Problems to be Assessed in Step 2

In many low-resource settings, fetal-neonatal deaths from almost every cause may be excessive as compared to those in a standard population. However, no program can address all of these problems at once. One problem or a group of related problems must be prioritized. This prioritization process (outlined in Figure 3.3) requires dialogue between the program manager and stakeholders as well as a review of information combined from quantitative data and stakeholders' perceptions. The key problem is prioritized in Step 1 and the "right intervention" and strategies to address the problem are discussed in Step 3.

In terms of quantitative data, the most important problem is the one with the highest attributable risk (described in Part Two). Attributable risk measures the effect of the condition on the population. This means that it is a measure of the amount that the outcome (fetal-neonatal deaths) can be attributed to a certain problem (i.e., neonatal tetanus). There are two factors that influence the attributable risk of a problem.

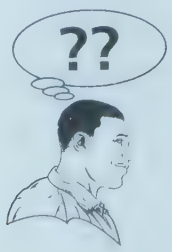
> **Severity:** Severity refers to the likelihood of death. The epidemiological term is relative risk (described in the epidemiology section). For example, neonatal tetanus has a case fatality rate of 90 percent, which means that out of 100 newborns with neonatal tetanus, 90 die. Hence, even if neonatal tetanus has a low frequency within the population, it may account for many deaths because of its high severity.

> **Frequency:** Frequency refers to how common the condition is in the population. The epidemiological term is prevalence (described in the epidemiology section). For example, in Bangladesh 30 percent of newborns weigh less than 2500 grams. Thus, even though low birth weight does not have a high severity (as compared above), it is very common in the population, so it may account for many deaths.

Attributable risk measures the combination of severity and frequency. Some conditions, such as neonatal asphyxia or neonatal sepsis, are important because they are both frequent and severe. Other conditions are important because they are either very common or very severe. An appreciation of the importance of rare conditions that are severe, or nonsevere conditions that are common, will help the program manager identify which cause of death is epidemiologically important in the local setting.

The views of the stakeholders are crucial in selecting a problem category. If a specific condition is responsible for the most deaths, but the stakeholders are not concerned about it (i.e., LBW), it may be better to choose another problem that does elicit widespread concern.

If BABIES is being used, by the end of Step 1, the program manager and stakeholders will have identified the key problem areas or gaps in their setting to be one of the following:



pre-pregnancy health;
care during pregnancy;
care during delivery; and
newborn care.

Step 1 is useful in focusing the problem areas to one of the four time periods. This process helps the program manager and key stakeholders focus on the key services to be reviewed in Step 2 – assessing the performance of the HCDS. Assessing the whole HCDS for every time period would be costly and impractical.

D. How Can the Key Stakeholders Participate in Defining the Problem?

The reason to involve the stakeholders is to foster ownership of the problem. In many communities with high rates of fetal-neonatal and maternal mortality, there will be other major social, economic, and health problems that may be perceived as more important to the community. People may feel that no problem exists—that it is normal for neonates to die. There are many methods to involve stakeholders in the process. More details are provided under Step 3b. A few suggestions follow.

The informal/community sector may be involved through participation in community meetings, stakeholder meetings, focus group discussions, discussions of formal health system data (review of log books, etc.), and by providing information about specific fetal and neonatal deaths (verbal autopsies).

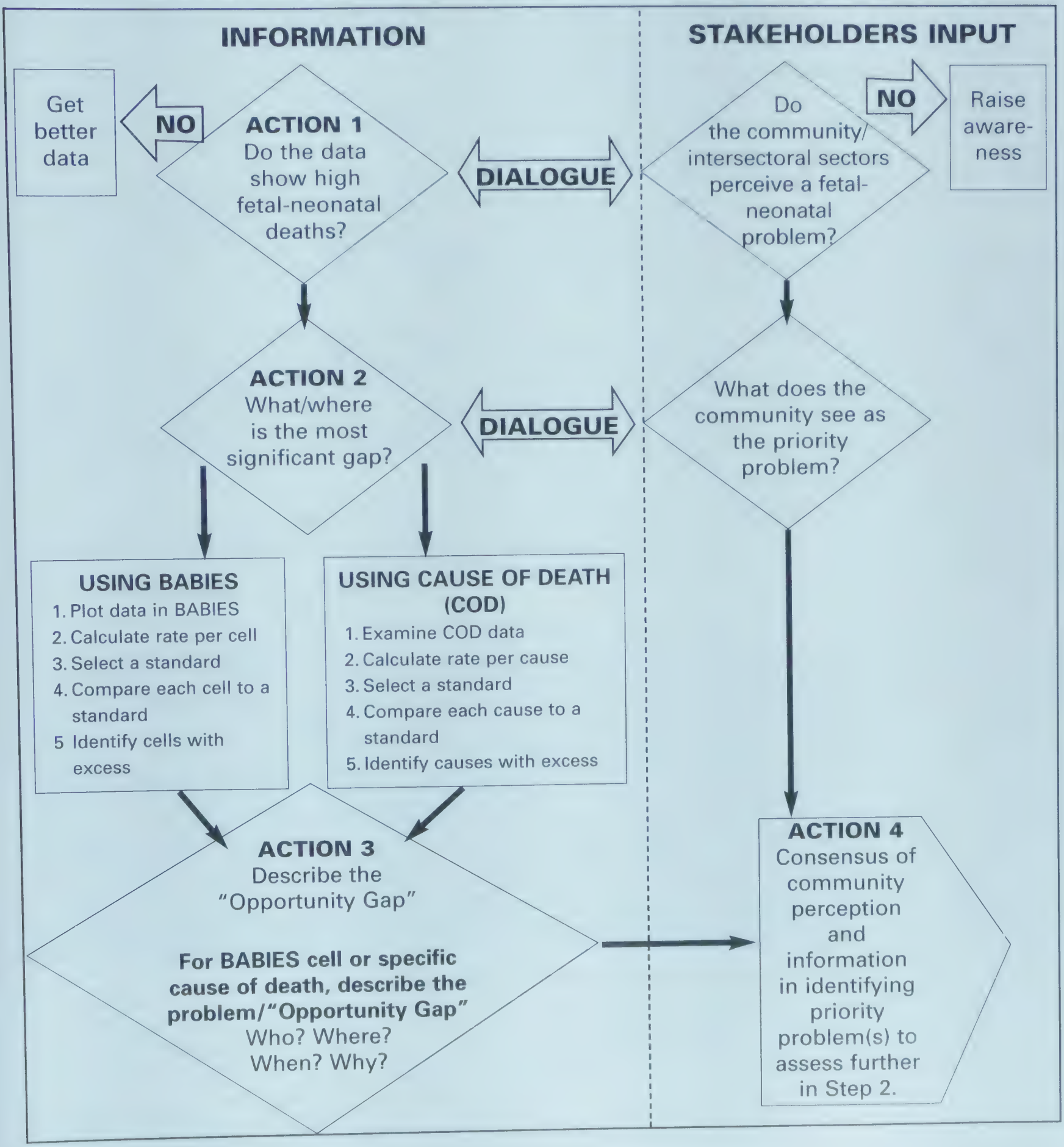
The intersectoral sector may be involved through participation in community meetings, stakeholder meetings, focus group discussions, discussions of formal health system data (review of log books, etc.), and by providing information on upcoming projects that they may undertake (building roads, bridges).

The formal sector may be involved through the analysis of service statistics, review of key documents (case notes, supervision records), participation in stakeholder meetings and focus group discussions, by providing information on upcoming activities, and by participating in discussions of the formal health system data (review of log books, etc.). The personnel in the formal sector will also be responsible for collecting new data and for sharing the new results with other sectors.

STEP 1 DEFINE THE FETAL-NEONATAL HEALTH PROBLEM

SUMMARY

FIGURE 3.3
SUMMARY FOR STEP 1, DEFINING THE FETAL-NEONATAL HEALTH PROBLEM



STEP 1 DEFINE THE FETAL-NEONATAL HEALTH PROBLEM

SUMMARY

What is a problem?

A problem is the existence of a gap between the way something is and the way we want it to be. Without data, this is just an opinion. The problem has to be identified both by epidemiological data and by the community.

Was the appropriate information collected, reviewed, and used to define the problem?

Action 1 Collect and examine the data.
Review existing data, either in terms of cause-specific problems or using BABIES to identify a category of problem (i.e., care during delivery).
Collect selected pieces of new data.
Change raw data into rates.

Action 2 Compare local data with a standard population.
The "Opportunity Gap" is the difference in rates (mortality and/or morbidity) between populations in health status. If one population has already achieved a better health status than the other, the difference also provides an opportunity to improve the status of the less healthy population – this is called the "Opportunity Gap."

Action 3 Understand the "Opportunity Gap" in the local setting.
Understand the gap in terms of time, person, and place. Examine the root causes, possibly using the fishbone diagram.

Action 4 Identify the key problems to be assessed further in Step 2.

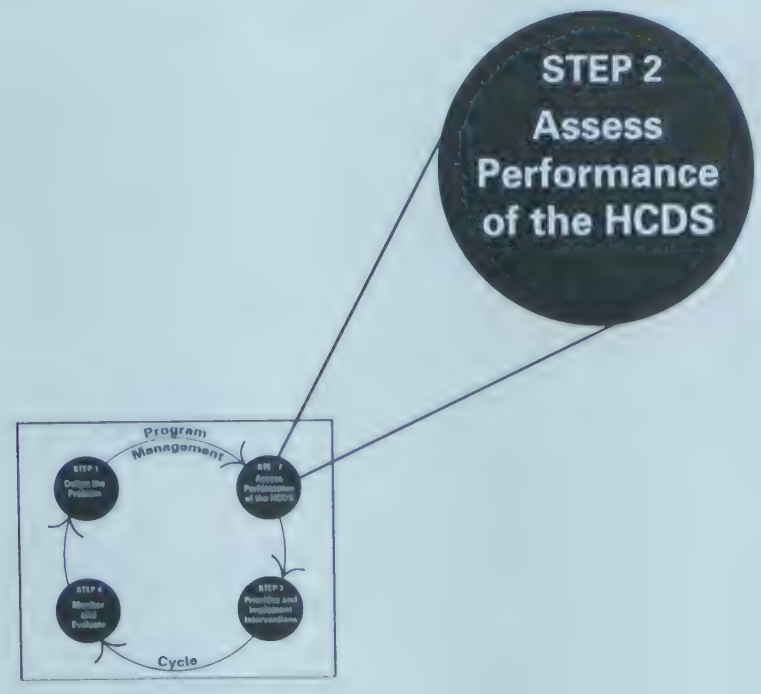
KEY QUESTIONS

- Is fetal-neonatal health a priority problem in the local setting?
- Redefine the problem in terms of categories (pre-pregnancy health, care during pregnancy, care during delivery, newborn care) or specific causes, like neonatal tetanus.
- What is the extent of the problem ("Opportunity Gap")?
- Is there an explanation for the "Opportunity Gap" (Who, Where, When, Why)?
- What is the root cause for the priority problem? Use the fishbone/But why? diagram to identify the root cause.
- What areas of the HCDS need to be assessed in Step 2?

Were the key stakeholders involved in defining the problem?

- Informal/community
- Intersectoral system
- Formal health care system

STEP 2 ASSESS PERFORMANCE OF THE HEALTH CARE DELIVERY SYSTEM



A. Summary of Step 1

B. What is Performance Assessment?

C. How is Performance Assessment Done?

D. How Can Data/Information be Used to Assess Performance?

E. How Can Key Stakeholders Participate in Performance Assessment?

Summary of Step 2



TERMINOLOGY FOR PART THREE

STEP TWO

Capacity: The ability to fulfill a given role in a given setting. The term may be applied to individuals but is more commonly applied to institutions or organizations. Capacity may apply to a variety of roles – technical, logistical, etc.

Effectiveness: The ability to undertake the right interventions to produce a desired result.

Efficiency: The ability to do interventions in the right way, so that high-quality services result.

Performance assessment: A process that enables the program manager and stakeholders to assess the effectiveness and quality of interventions.

Right intervention: An intervention that can produce the desired result for a given problem in a given population.

Right way: Implementing an intervention as intended and efficiently, resulting in high-quality services.

A. Summary of Step 1

During Step 1, the program manager and stakeholders identified the key problem areas or gaps in their setting. The problem was identified in terms of a specific cause of death, such as neonatal tetanus. If the cause of death data are limited and BABIES was used, the problem was identified in terms of one of the following key categories:



pre-pregnancy health;
care during pregnancy;
care during delivery; and
newborn care (essential, emergency, extra).

Step 2 identifies how resources (financial, human, and material) are allocated and used with respect to the key problem identified in Step 1. Performance assessment (Step 2) enables the program manager and key stakeholders to decide which core services are required to address the given problem in their setting. Do these services exist, and if so, are they being implemented efficiently? Inappropriate or inefficient use of resources will reduce the number of newborn lives saved. This assessment can also identify the community's satisfaction with the quality of the services provided.

B. What is Performance Assessment?

There are two components of performance: effectiveness and efficiency. A system can be effective (right intervention) but inefficient (poor quality) or ineffective (wrong intervention to achieve the desired result) but efficient (high quality). Neither scenario will have a significant impact on reducing neonatal mortality. Capacity is an intrinsic component of performance; without some level of capacity (skills, knowledge, attitudes, and resources), good performance is unlikely.

Effectiveness: The ability to undertake the right interventions to produce a desired result.

Efficiency: The ability to do interventions in the right way, resulting in high quality services.

Evidence-based standards are essential for the provision of high-quality effective services. However, developing these standards and protocols can be very time-consuming. The World Health Organization and JHPIEGO, in collaboration with a large group of international experts, produced the Managing Complications of Pregnancy and Childbirth (MCPC) Guidelines, which are referenced in this manual and accessible on the attached CD-ROM. Program managers can adapt these guidelines to their own settings. These standards provide a measure to assess performance if national guidelines are not yet present in a particular country. Even if standards are in place, they may not be applied for many reasons.

C. How is Performance Assessment Done?

The performance assessment requires the program manager and stakeholders to answer several key questions, which include:

What is supposed to be happening in the HCDS?
What do people think is happening in the HCDS?
What do people say is happening in the HCDS?
What is actually happening in the HCDS?

To answer these questions in the three sectors of the HCDS, the program manager must complete the three actions presented below.

Step 2 – Action 1: Determine what the core/basic services are to address the problem identified in Step 1. This should include defining the standard of care expected at each level of the HCDS.

Step 2 – Action 2: Assess the existence of these basic services. (coverage of services).

Step 2 – Action 3: Assess the quality of the basic services.

This approach begins with the key problem area identified in Step 1, examining the main components of the intervention areas, and assessing the capacity and quality of each component.

STEP 2 – ACTION 1. Determine the Core/Basic Services

Before assessing what is in place, the program manager must know what is needed (the right thing) to address the problem identified in Step 1. In order for the program manager to do this, there are three tasks that need to be undertaken: 1) identifying the main problem area; 2) identifying the core/basic services to address the problem area; and 3) articulating a standard of care for those core/basic services.

STEP 2 – ACTION 1.

TASK 1.1 Identify the Main Problem Area

The main problem area(s) to address the problem identified in Step 1 need to be articulated, which may include pre-pregnancy care, care during pregnancy, care during delivery, and postpartum care/newborn care.

STEP 2 - ACTION 1.

TASK 1.2 Identify the Core/Basic Services Within the Problem/Intervention Areas

Once the main gap is selected, for example pre-pregnancy care, the core/basic services needed to address this gap need to be articulated based on a standard of care. For example, the core/basic services for pregnancy care include family planning, maternal nutrition, and prevention and treatment of STIs among women of reproductive age.

STEP 2 - ACTION 1.

TASK 1.3 Articulate the Standard of Care for the Core/Basic Services

If in the local setting, the main gap was during the pre-pregnancy time period, then the Pre-pregnancy Health Intervention Package would be the most appropriate to address the gap. The package components (core services) of the Intervention Package would be family planning, nutrition, and prevention and treatment of STIs. Once these categories have been established, then the questions becomes *What is the standard of care?* For example, the standard of care for family planning services may include that women need to receive accurate information on all methods to make an informed choice on a daily basis. Once there is a clear understanding of the standard expected of the service, then the services can be assessed. For example, if the family planning services are assessed and services are not available every day, then the standard of care has not been met.

One way of helping the program manager and stakeholders think about how to prioritize the various interventions that can be implemented is the Spider Web Framework developed by CARE. This framework aims to serve three main purposes, which include:

- fostering a way to think of maternal and newborn health programs in a comprehensive, inter-related way;
- facilitating the use of key Intervention Packages that can effectively address maternal and/or neonatal health outcomes; and
- prioritizing services within the Intervention Package(s) in terms of levels of development.

Based on the Pathway to Survival (Figure 1.8), which highlights the inter-relatedness of maternal and newborn outcomes, the Spider Web Framework (Figure 3.4) attempts to provide a way to look comprehensively at Intervention Packages, addressing both the mother and the newborn. With that said, the Intervention Packages can be examined individually as well as in terms of their overall objectives and specific package components which are further discussed in Part Four. Lastly, the Spider Web Framework tries to help program managers, who work in very resource constrained situations, understand some fo the first things they should do to address fetal and neonatal mortality, despite their many challenges. Thus, the Spider Web Framework is broken down into three main service areas within each Intervention Package. These services include:

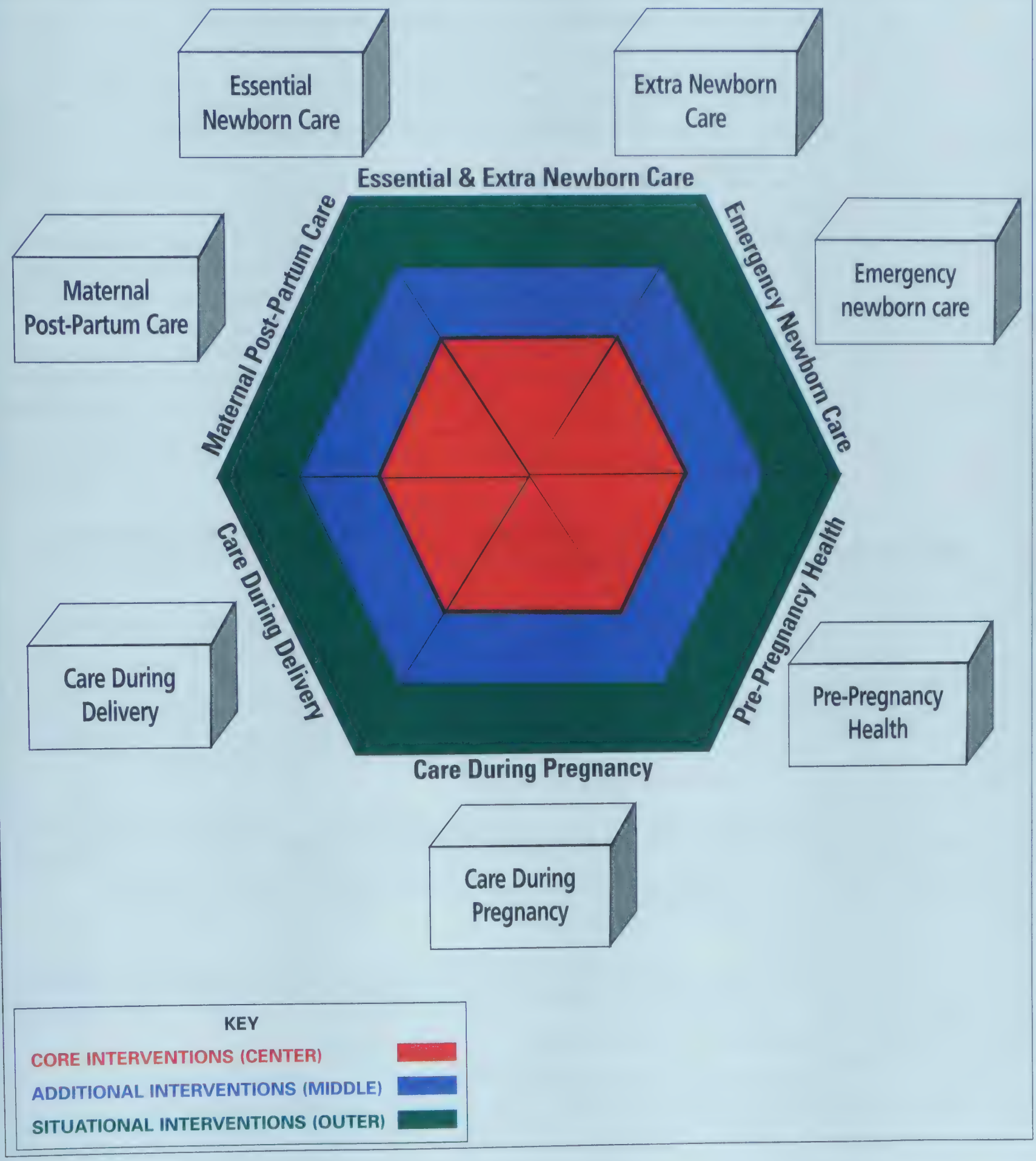
- core services;
- additional services; and
- situational services

The core interventions are the basic services that should be available in all settings for that package. The additional interventions may be added as local capacity and resources increase. The situational interventions are appropriate in a given situation but not in all settings. For example, if malaria is endemic locally, presumptive treatment of malaria in pregnancy is important. However, this guideline does not apply to a setting where malaria is not endemic.

The details in Part Four aid in deciding what core services would be appropriate in the setting to address the chosen priority problem. If the identified problem is due to a specific cause of death, more information for the major causes of newborn deaths (listed below) can be found in Part Four.

- Severe infections.
- Neonatal tetanus.
- Birth asphyxia.
- Birth defects.
- Jaundice.
- Extra care of the LBW baby.

FIGURE 3.4
A WEB OF INTEGRATED INTERVENTION PACKAGES BY TIME PERIOD



STEP 2 – ACTION 2: Assess the Existence and Coverage of Core/Basic Services

Once the core/basic services are selected for the identified problem, the question becomes, *Is the right thing (the standard) being done?* or *Do the required services exist?*

If the services do not exist, it is not possible to carry out Action 3 (Assess Quality). Furthermore, Step 3a, which focuses on prioritization of interventions, is answered because the priority is to establish the basic services to resolve the identified problem.

If these services do exist, it is important to know how much of the population the services are reaching. If syphilis testing and treatment are in place but reaching only five percent of the population, and possibly those least affected, it will have little impact on newborn outcomes. If skilled birth attendants are available but only 20 percent of the population are delivering with a skilled attendant, it is crucial to understand why this is happening.

Data are required to assess coverage of health services. There may be existing data, but in many cases, the required information will not be available. In this situation, try to use what is known to make an estimate, or administer a survey to collect the necessary data. Part Two gives suggestions on using available data to make estimates and selective collection of new data. An example of the use of data to assess performance of the HCDS is provided in Table 3.9.

TABLE 3.9
PERFORMANCE ASSESSMENT: CARE DURING PREGNANCY EXAMPLE

The identified priority problem area was care during delivery.

The standard agreed upon was to screen all women for syphilis at antenatal care (ANC) and to provide free treatment for all positive women with partner tracing.

The collected information for the performance assessment is summarized below.

- ANC records showed that about 65 percent of pregnant women attended at least one antenatal visit (the denominator was estimated by using the method in the epidemiology section in Part Two).
- ANC records showed that less than 10 percent of women received syphilis testing.
- Laboratory records showed that 15 percent of the pregnant women tested for syphilis were positive.
- Review of syphilis-testing records and pharmacy prescription records revealed that only half of those who tested positive received treatment.

The fishbone diagram was used (see Part Two) to examine the underlying causes. Interviews with the staff and women revealed that the underlying causes were inadequate stocks of testing supplies and penicillin and poor follow-up of women who tested positive.

STEP 2 – ACTION 3. Assess the Quality of the Services

Are the right services being provided in the right way? This question applies to communities, not just institutions. For example, if birth planning/preparedness is a core service and is provided, the next question is how well is it being implemented? Attention to quality of care is essential to the success of any intervention. High-quality health services may appear beyond the resources of most developing country settings. However, program managers cannot afford to ignore quality issues. Improving quality often pays for itself in terms of greater efficiency and improved outcomes.

Standards are an essential part of promoting quality care. If standards are not in place or not well understood, then anything can happen. In order to assess quality, the manager needs to determine how well each of the three HCDS components (informal, formal, and intersectoral) are performing with regard to the standards. The methods and tools used will depend upon the services being assessed and the local setting. An integrated health-facility assessment for child survival developed by BASICS is available on the CD-ROM and could be adapted for newborn health assessments BASICS. The WHO Safe Motherhood Needs Assessment and other materials are provided on the CD-ROM.

In Table 3.10, an example is given of how performance of the HCDS is assessed in the three sectors of the HCDS.

TABLE 3.10
ASSESSING PERFORMANCE OF THE HCDS SECTORS: EXAMPLE OF CARE DURING DELIVERY

	INFORMAL/ COMMUNITY	INTERSECTORAL	FORMAL
What is supposed to happen? (Protocols/clinical standards, administrative procedures)	TBAs are supposed to accompany women to the health center/hospital for delivery.	A particular road, which is crucial for access to emergency obstetric care, is supposed to be in good condition.	The doctor is supposed to be at the facility 24 hours a day.
What do people think is happening?	Some women are sent to the hospital if they develop complications.	The local development officer thinks that the road is passable except in the worst part of the rainy season.	The doctor is there most of the time.
What do people say is happening?	TBAs ask for their money up front and then deliver the baby at home.	The road is passable for about half the year, with difficulty.	The doctor is gone after 8 p.m. to his private clinic.
What is actually happening?	TBAs don't want to refer women because they will lose money.	None of the buses or taxis will drive on the road because it is in such bad condition.	Doctor is gone after 2 p.m.

Interventions to enhance quality are most effective when all of the health personnel and the community have an active part in defining what quality means for them and how they might achieve it. Part Two contains a further explanation of quality management principles and tools to assist the program manager in developing and implementing sustainable approaches for improving quality. The fishbone/"But why?" diagram is especially useful in examining root causes for poor performance. For example, poor monitoring of women in labor may be due to not using the partograph. The reason for this may be the lack of available copies of the partograph, despite training of the staff. The results of the fishbone is very useful in identifying potential solutions.

Table 3.11 provides some tools that can be used to foster performance assessment of the HCDS.

TABLE 3.11
TOOLS TO ASSESS PERFORMANCE IN HCDS

TOOL OR METHOD	KEY INFORMATION COLLECTED
Health facility assessments.	Appropriateness of site; presence of equipment, drugs.
Interviews/observation of staff.	Training, skill, and attitudes of staff.
Case reviews/audits.	Are standards of care being implemented for emergencies?
Exit interviews.	Quality of information given to clients; client satisfaction with the approach of the caregiver.
Resource mapping.	Resources available in the community and at all levels to respond to the identified problem.
Social mapping.	People of influence and social relations who may facilitate or obstruct performance.
Household interviews.	Used to collect many types of information; for performance assessment, they may be used to evaluate traditional practices.
Fishbone/But why? diagram.	To assess underlying reasons for poor performance.

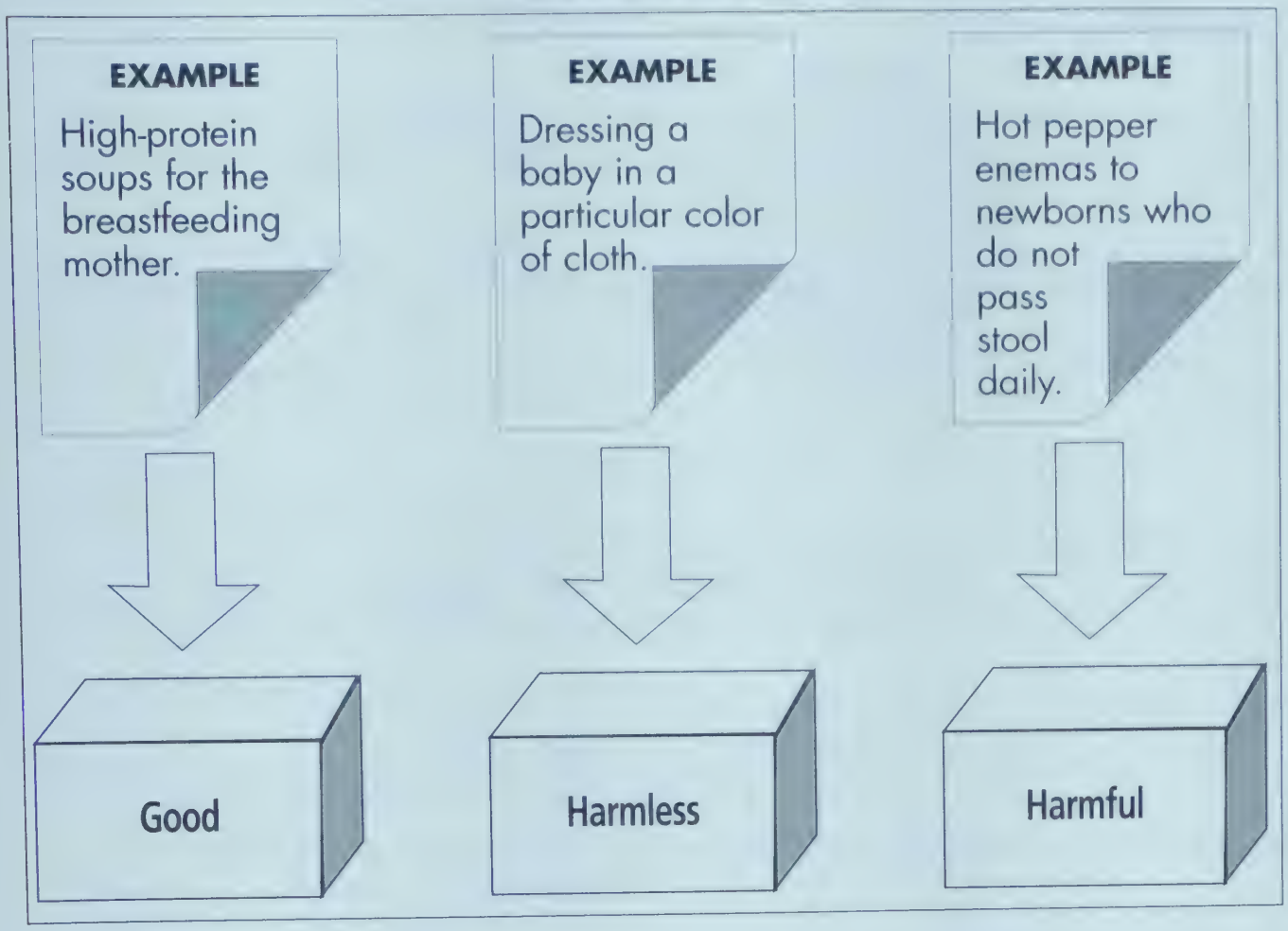
D. How Can the Key Stakeholders Participate in Performance Assessment?

The stakeholders helped identify important problems in Step 1. They may have opinions about what is being done, or not done, to resolve these problems and have their own opinions of the current HCDS performance.

The intersectoral sector: In the intersectoral sector, authorities may be unaware of the needs for input to improve newborn or maternal outcomes. For example, there may be a need to improve the surface on a crucial road that leads to the only provider of emergency obstetric care in a given region.

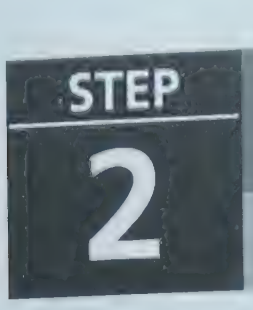
The formal health care sector: There are many factors that influence performance in the formal sector, including poor pay and lack of supervision and motivation. Good performance may go unnoticed or even be punished. For example, a pregnant woman may be criticized for calling attention to her problems, or a health care worker may have to work longer hours after recognizing a problem.

FIGURE 3.5
ASSESSING TRADITIONAL PRACTICES



The community or informal sector: To understand local beliefs and practices, a careful assessment of pregnancy, childbirth, and fetal-neonatal care is important. There are many approaches to collecting information on health beliefs and practices, including participatory approaches, case studies, verbal autopsies, and other social science methodologies. It is important to recognize that not all traditional practices are "bad." Some are of great benefit, and others are likely to be harmless. Identifying and reinforcing beneficial practices can help empower the community to alter harmful practices. To prioritize the harmful practices, they must first be recognized. Figure 3.5 shows a simple way to do this. Write down all of the common local practices and file each in one of three boxes (good, harmless, or harmful, depending on the impact on mothers and newborns).

The community assessment should also consider potential resources to deal with the identified newborn health problems. For example, if transportation for mothers or newborns with emergencies is identified as a problem, community funds could be used to provide emergency loans.



ASSESS PERFORMANCE OF THE HEALTH CARE DELIVERY SYSTEM

SUMMARY

Why and how to assess performance?

Performance matters. The only way a system operates effectively and efficiently is for quality to be a priority. Quality is not expensive; the lack of it is.

Performance assessment is an evaluation of the effectiveness and efficiency of current interventions and strategies to address the priority problem. Are the right things being done? Are they being done right?

Was the appropriate information collected, reviewed, and used to assess performance?

Action 1. Decide what the core/basic services are to address the problem.
What is the right thing to do?

Action 2. Assess the coverage of the basic services.
Is the right thing being done? Do basic services exist and what proportion of the population do they serve?

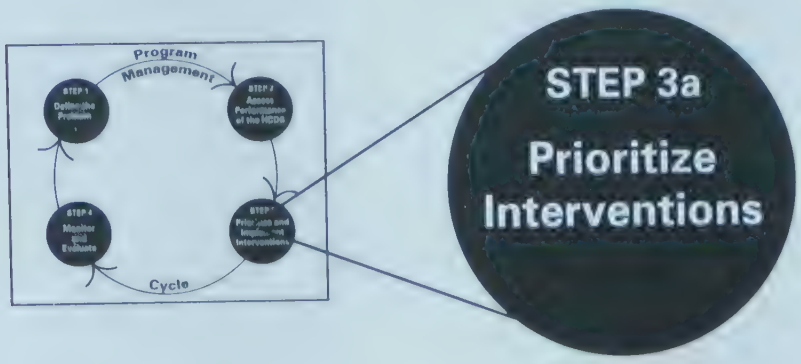
Action 3. Assess quality of the services.
Is the right thing being done right?
There are many tools to use including integrated health facility assessments, exit interviews with clients, and the fishbone diagram to identify underlying causes.

Were the key stakeholders involved in performance assessment?

The community, formal health care system, and intersectoral stakeholders should be actively involved in assessing the performance of their own sector, as well as the performance of the formal health care sector. Traditional practices related to the priority problem should be examined.

- What is supposed to happen?
- What do people think is happening?
- What do people say is happening?
- What is actually happening?

STEP 3a PRIORITIZE INTERVENTIONS



A. Summary of Steps 1 and 2

B. What is Prioritization?

C. How to Prioritize Interventions.

D. How Can Data/Information be Used to Prioritize Intervention Packages?

E. How can Key Stakeholders Participate in the Prioritization of Interventions?

Summary of Step 3a.



TERMINOLOGY FOR PART THREE

STEP THREE A

Attributable risk percentage: An epidemiological measure regarding a given condition, showing how much of the outcome occurring in the population is due (attributable) to that condition. The magnitude of the attributable risk percentage of a condition is related to both the severity of the condition and how frequently it occurs. For example, neonatal tetanus may be relatively rare, but if 90 percent of cases die, it may account for 30 percent of neonatal deaths in a given setting.

Countermeasure matrix: A quality assessment tool that uses a matrix to help team members show the relationship among the problem statement, root causes, and countermeasures.

Prioritization: A process whereby potential interventions are reviewed to select the most effective, feasible, and acceptable ones.

A. Summary of Steps 1 and 2

At this point in the program management cycle, the program manager and stakeholders have:

- identified the problem areas (i.e., care during pregnancy);
- agreed upon core services with regard to that area (i.e., four visits for antenatal care, anemia treatment, address syphilis and malaria, birth planning);
- assessed that the interventions are the right interventions to address the defined problems and the level of service coverage; and
- evaluated whether the right services are being done in the right way (quality).

B. What is Prioritization?

There are many interventions that are effective for reducing both maternal and neonatal mortality, but these cannot all be implemented at once. While the final goal is to establish a complete system with all of the key services and interventions working well, this must be achieved gradually. It is important to start with the interventions that will have the greatest effect on newborn (and maternal) survival locally, but they should also be the most feasible. The priorities may vary from one setting to another.

For example, birth asphyxia may be the biggest problem for newborn health in Areas A and B. The main interventions to reduce birth asphyxia are better care during delivery and competency in newborn resuscitation. If the skilled birth attendant coverage in Area A is only 15 percent and there is no emergency obstetric care, the priority would be to improve basic care and access to emergency care during delivery. In Area B, 80 percent of women deliver with skilled providers, emergency obstetric services are good, and the cesarean section rate is eight percent. Thus, Area B might focus on introducing standards for newborn resuscitation and competency-based training.

Prioritization is a process whereby the core services that can address the problem are reviewed to select the key interventions that will have the greatest effect on the problem, yet be feasible and acceptable. This is the *right* intervention, which will be the most effective in the setting. Once the right interventions have been selected, appropriate strategies *(the right way)* can be developed to maximize the effectiveness of the interventions.

To target priority problems, the program manager must answer two key questions:

> *What is the right intervention to address this problem in my setting?* Which intervention will make the most difference to my problem and also be feasible in my setting?
>
> *How can I implement this intervention in the right way?* Who will do what and where and how? Can I target my strategy to a particular place or group (i.e., adolescents, LBW babies)?

Table 3.12 provides some examples of what the program manager and stakeholders may have found in Steps 1 and 2.

TABLE 3.12
EXAMPLES OF RESULTS FROM STEPS 1 AND 2

PROBLEM AREA/ INTERVENTION PACKAGE	RIGHT INTERVENTIONS CORE SERVICES	ARE THE RIGHT SERVICES IN PLACE?	RIGHT WAY (QUALITY)
Pre-pregnancy health.	Nutrition, family planning, prevent/treat STIs.	FP and STI services are available in the town but are used by only a small number of people.	Poor counseling skills. Stocks of drugs for STI treatment. Adolescents cannot access FP or STI services because of social barriers.
Care during pregnancy.	ANC visits, Rx anemia, Rx malaria, Rx syphilis, birth planning.	ANC coverage is 65%. Screening and treatment of syphilis is a national standard, but it is not carried out locally.	Lack of reagents and lab facilities for syphilis testing. No tracking system to treat women and their partners. Lack of adequately trained staff. Limited knowledge among the population about signs/symptoms.
Care during delivery.	Skilled attendance, availability of emergency care.	60% of women deliver with a skilled caregiver, but emergency care is limited.	No anesthesia available at facility. No blood bank. Limited transportation or resources to pay for services. Limited number of technically competent staff. Services available only about 6 hours per day (9 a.m. to 3 p.m.).
Newborn care.	Essential newborn care, care of LBW baby, emergency newborn care.	Essential care and extra care of the LBW baby is available only to institutional deliveries (30% of total deliveries). Emergency care of sick newborns is virtually non-existent.	Essential care is not well practiced, even in the hospital. There are no written standards for care. No staff have been trained in newborn resuscitation. More than half of the babies are hypothermic. Early breastfeeding (within 1 hour of delivery) rate is only 10%. Eye prophylaxis is not given to any baby, although gonococcus is common.

More details on specific interventions are provided in Part Four. In this step we consider the decision-making process of selecting the most suitable interventions, and potential implementation strategies are discussed.

C. How to Prioritize Interventions

The first step in the prioritization process is to select the criteria by which the options can be assessed. In this discussion, five criteria recommended by WHO are considered below. In situations in which resources are limited, it is often a challenge to identify interventions with strong evidence and particularly data on cost-effectiveness. Though evidence from scientific trials is important, for many of the major causes of fetal-neonatal deaths, there is a lack of evidence from randomized controlled trials in low-resource settings. If there is an international consensus that the intervention is beneficial, if it addresses a problem in the local setting, and if it is feasible, the lack of extensive scientific evidence should not stop the program manager from applying the intervention. However, this lack of evidence makes it important to carefully document the method, costs, and results.

D. How Can Data/Information be Used to Prioritize Intervention Packages?

The information for prioritizing a given intervention package and/or its components will include both local data (collected in Steps 1 and 2) and information about the intervention. Part Four contains a summary of the available information on the key packages and interventions to address priority problems in newborn health. This can help the program manager identify evidence-based interventions.

A locally important problem: The intervention selected should address the priority problem identified in Steps 1 and 2. However, in many low-resource settings, almost every neonatal death may be a problem. There will be excess deaths due to infections, asphyxia, birth defects, and many other causes. Step 1 outlined some ways to decide which are the key problems, including the concept of attributable risk and the importance of the community's perception of a priority problem.

Effectiveness of the intervention(s): After the problem is identified, the question is whether there is an intervention with proven effectiveness in resolving it. Interventions may be effective in one setting but highly dependent on infrastructure and therefore not feasible in another setting. However, the program manager needs to assess their effectiveness in the local setting. For many fetal-neonatal health problems, there is a lack of high-quality evidence for interventions, such as from randomized controlled trials. The Intervention Packages described in Part Four are based on a review of the current literature and lessons learned from a variety of successful programs. These practices reflect the best understanding of the most effective interventions that contribute to a reduction in maternal and newborn mortality and morbidity. These recommendations may change as new research findings and program results become available.

Cost-effectiveness: Despite the misperceptions that maternal and fetal-neonatal health care must be costly, many interventions can have very positive results for relatively little cost. Unfortunately, there are limited cost data on fetal-neonatal health interventions, but certain interventions have been shown to be highly cost-effective, such as breastfeeding, kangaroo care, and family planning. However, if there is an effective intervention to address an important problem in a setting and the intervention meets other criteria, it should still be considered despite the lack of cost-effectiveness data.

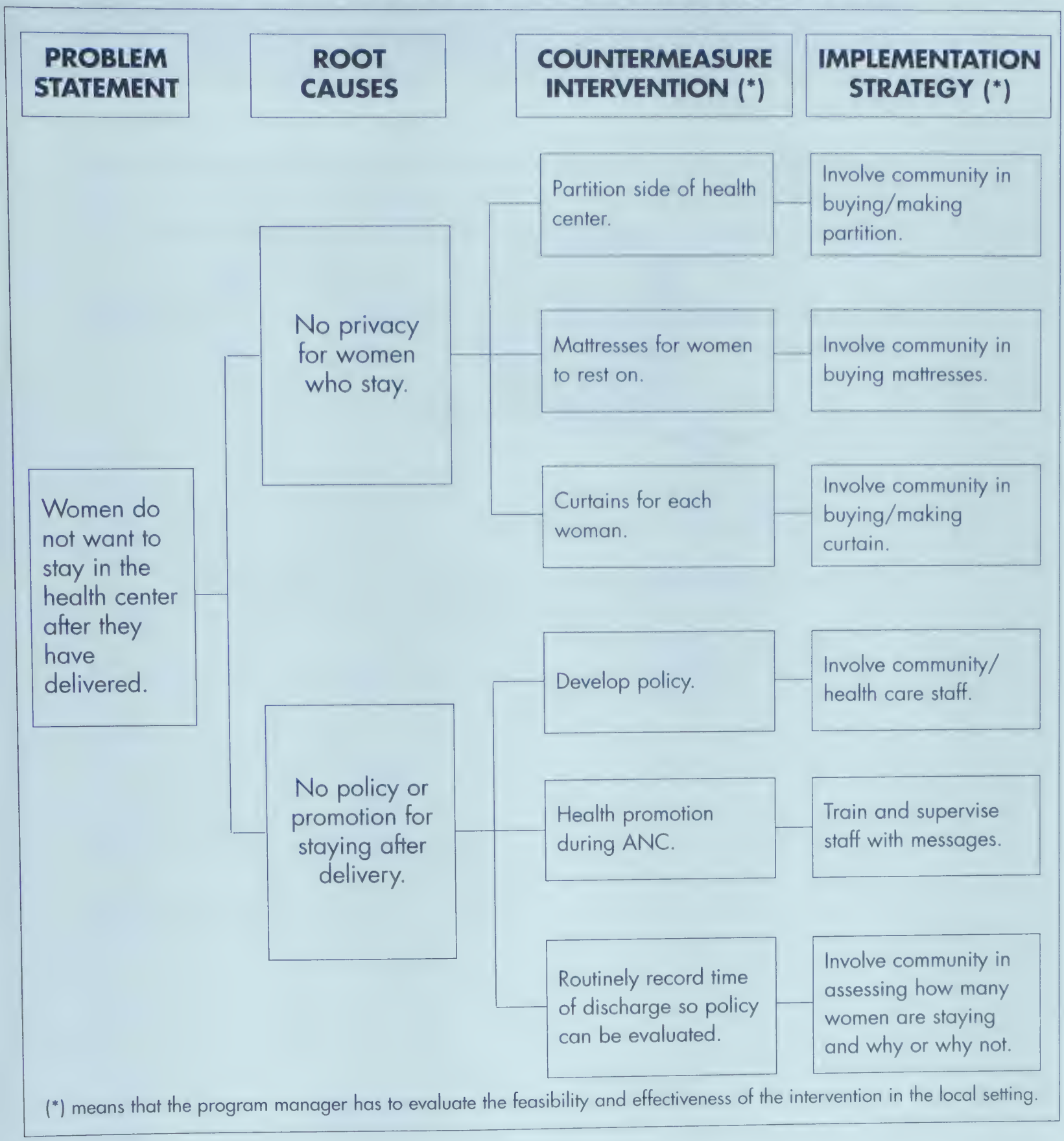
Feasibility and sustainability: An intervention is feasible if there is a consensus that it can be implemented successfully in the local setting despite resource constraints. For example, there are a variety of effective interventions to address hypothermia in LBW babies (i.e., heat lamps, incubators, kangaroo care). However, if a setting lacks regular electricity, kangaroo care is a more feasible (and still effective) intervention to achieve the desired result. Sustainability must be assessed at the outset of the project. The countermeasure matrix detailed in the quality management section of Part Two is useful for assessing exactly how an intervention will be carried out. Thus, it is a good tool to assess feasibility.

Acceptability to the community: To be sustainable, an intervention must be acceptable to the community. Although an intervention may represent new ideas for the community, the strategies must consider the community's culture, traditions, and values. Community members must be seen as full partners who can make recommendations about what is effective and feasible in the local setting.

E. How Can The Key Stakeholders Participate in the Prioritization of Intervention Packages?

Select a priority that is important to the community, feasible, and will ideally show results quickly. Community input is particularly important in determining the effectiveness and feasibility ratings in the countermeasure matrix. Figure 3.6 provides an example of a completed countermeasure matrix. Instructions on how to complete a countermeasure matrix are provided in Part Two. In summary, a problem statement regarding performance is agreed upon, and then the root causes are listed. For each root cause "countermeasures" or solutions are suggested. The feasibility of these countermeasures in the local setting and their implementation strategies are discussed until an agreement is reached on the best options(s). Figure 3.6 is a real case from a quality management workshop in Tanzania.

FIGURE 3.6
THE COUNTERMEASURE MATRIX USED TO IDENTIFY INTERVENTIONS AND STRATEGIES TO ADDRESS SHORT STAYS IN A HEALTH CENTER AFTER DELIVERY



(*) means that the program manager has to evaluate the feasibility and effectiveness of the intervention in the local setting.

STEP 3a PRIORITIZE INTERVENTIONS

SUMMARY

What is prioritization?

Prioritization is a process whereby all the potential options (interventions that will address the problem) are reviewed according to a set of criteria. The aim of this process is to select the key interventions that will have the greatest impact on the problem in the local setting.

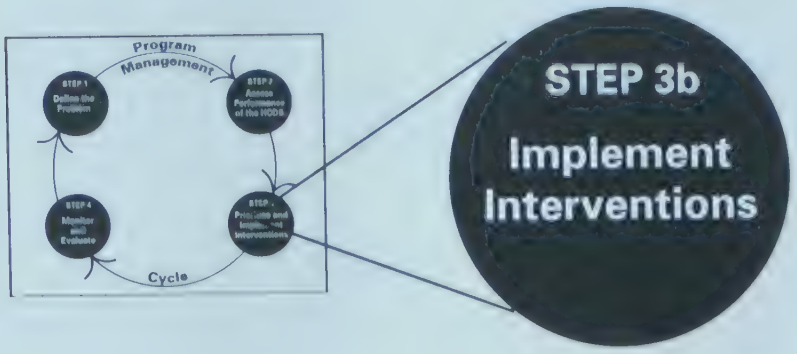
Was the appropriate information collected, reviewed, and used to prioritize the intervention?

- Addresses a locally important problem
- Evidence-based
- Cost-effective
- Feasible and sustainable
- Acceptable to the community

Were the key stakeholders involved in prioritizing the intervention(s)?

- Informal/community
- Intersectoral system
- Formal health care system

STEP 3b IMPLEMENT INTERVENTIONS



A. Summary of Steps 1, 2, and 3a

B. What is an Implementation Strategy?

C. How Can Data/Information be Used to Implement Interventions?

D. What Are the Key Strategies for Implementing Interventions?

- Creating partnership
- Empowering communities
- Promoting healthy behaviors
- Building capable institutions
- Advocating for supportive policies

Summary of Step 3b.



TERMINOLOGY FOR PART THREE

STEP THREE B

Advocacy: Promotion of an issue among policymakers and program planners.

Behavioral change: Characterized as proceeding through four stages: precontemplation, contemplation, action, and maintenance to result in a change to a desirable behavior.

Capacity-building: Increasing the ability of a local institution to provide high-quality services appropriate to the local setting; involves performance assessment and targeted strategies to improve staff competency, supply logistics, and other determinants of quality of care.

Competency-based training: Training of staff to the level at which they are fully skilled in the implementation of a certain practice, i.e., neonatal resuscitation.

Goal: A generally broad statement that guides the overall vision for a program.

Objectives: Statements about the expected short-term results (3-5 years) of an intervention; objectives should contribute to the overall goal, but be specific, measurable, achievable, realistic and time-bound.

Policy change: Modification of accepted procedures at any level on which policy is set – an individual, institutional, national level, or international level.

Skilled providers: Health care providers who have been trained to manage complications to competency level to manage complications.

Standard of care: Level of acceptable service that is expected to be delivered to all clients.

Timeline: Schedule of how often a given program will be implemented, monitored, and evaluated.

A. Summary of Steps 1, 2, and 3a

At this point, the program manager and stakeholders have:

- identified the problem area(s) (i.e., care during pregnancy);
- agreed upon a standard for care (i.e., four visits for ANC, treatment of anemia, syphilis, malaria, birth planning);
- determined whether the interventions are the right interventions to address the defined problem(s) and the level of coverage for these services; and
- prioritized the interventions on the basis of selected criteria.

Now the task is to develop implementation strategies for the interventions selected. Part Four describes the technical interventions (i.e., pre-pregnancy health, care during pregnancy, care during delivery, and newborn care). This section will discuss the components of developing an implementation strategy and five key cross-cutting strategies that support the implementation of the technical packages.

It is NOT the **lack of effective interventions** that has resulted in high fetal-neonatal mortality, but the **lack of effective implementation** of proven interventions.

B. What is an Implementation Strategy?

To effectively implement the right interventions, a comprehensive implementation strategy must be developed, one involving all sectors of the HCDS. The strategy should be based on data and information from the HMIS. It should also be acceptable to the community.

An implementation strategy should answer these questions:

KEY QUESTIONS

- **What is the goal?** What is our overall vision?
- **What are the objectives?** Exactly what do we plan to achieve?
- **What interventions will achieve our objectives?**
- **Where?** Which sectors of the HCDS will be involved and in what geographic location?
- **By whom?** Who will be involved in implementation of the interventions?
- **When?** How often will the interventions be provided?
- **Cost?** What is the budget for the strategy?
- **How?** How will the intervention(s) be implemented? (Example: through partnership)

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What interventions and strategies will achieve our objectives? The interventions selected need to be the right interventions to achieve the objective. To take a real example from rural Tanzania, an objective was to reduce newborn deaths in the first 24 hours after delivery. One problem identified in Step 2 (performance assessment) was that women who deliver in the health center do not want to stay. Use of the fishbone diagram identified the root problem as a lack of privacy for the women. The countermeasure matrix (Figure 3.6) was then used to identify interventions and strategies to address this. After a partition and curtains were installed the number of women staying 24 hours after delivery increased from 0 to 33 per month within 9 months of the intervention. They are now focusing on increasing the proportion of deliveries occurring in the health center and trying to get a female midwife because the male health care worker is difficult for women to accept.

Where? Where applies to both the level of the health care system and the geographic location. The information collected in Step 1 should determine the geographic region where the problem is concentrated. This may be a particular ethnic group in one geographic setting who have higher rates of neonatal tetanus due to lower TT2 coverage and a harmful local practice. The information collected in Step 2 should determine where the key strengths and weaknesses are in the health care system. If most deaths are in the community, this would be the focus of the implementation strategy.

By whom? Successful implementation of an intervention requires collaboration and teamwork. It is essential to identify individuals and organizations that will be actively involved in implementing and supporting the strategy. Those involved in implementation may include the community (i.e., volunteers, physicians, TBAs, traditional healers, organizations), field coordinators, program managers, NGOs, in-country agencies, or international agencies. After identifying those who will aid in the implementation process, roles and responsibilities must be clearly outlined and understood by all.

Often it is the quality of the personnel in a program and the relationships of the team members that are a major factor in the success of a project. This success is more likely if the roles of the various personnel involved are clearly understood. Supervision is an important task that takes time and should be included. The lines of responsibility must be well understood, especially if several partners (i.e., MOH, NGOs, donor agencies) are working together on a program.

When? Timelines are necessary to guide the overall workplace strategy. Table 3.14 illustrates how a timeline can be organized. The most common error is to underestimate the time necessary for any task, but especially for establishing a new intervention program. Involving the community may take longer initially, but it is more likely to result in sustainable benefits.

Cost? Before implementing any strategy, the costs of the program must be estimated. The planned allocation of costs should be compiled to form a budget.

How? A specific work plan can be developed after the goals, objectives, interventions, and implementation strategies are decided.

TABLE 3.14
TIMELINE FOR NEONATAL RESUSCITATION TRAINING

	YEAR 1							
	Jan.	**Feb.**	**Mar.**	**April**	**May**	**Jun.**	**July-Sept.**	**Oct.-Dec.**
Recruit trainers	X	X						
Assess current performance		X	X					
Develop and test materials; prepare training site		X	X	X				
Training trainers			X		X		X	X
Monitoring			X	X	X	X	X	X

D. What Are the Key Strategies for Implementing Interventions?

Cross-cutting strategies are essential to a program's ability to achieve its goals and objectives in the long-term. The five main strategies that will be discussed are:

1. creating partnerships;
2. empowering communities;
3. promoting healthy behaviors;
4. building capable institutions; and
5. advocating for supportive public policies.

1. Creating partnerships

What is partnership? For the purposes of this manual, partnership is defined as a combination of organizations or individuals united to achieve a specific objective.

Why partner? As stated previously, maternal and fetal-neonatal health problems are complex. They arise from a combination of social, cultural, environmental, and medical conditions that perpetuate the situation. All of these factors must be considered when selecting interventions and designing implementation strategies. The responsibility for solving this problem lies with local health professionals, communities, households, and women themselves.

Also, partnership provides opportunities to achieve a much greater result than could be achieved by any organization on its own. There may be economies of scale, or more simply the synergies of the different partners may facilitate the development and implementation process. Effective partnerships often maximize the respective comparative advantages (strengths) of the partner organizations. For example, NGOs usually work at the community level, focusing on those services (their strengths) that make the best use of resources. Similarly, the government usually has the health infrastructure (i.e., facilities, staff, and drugs). This division of labor may allow the partners to focus on their strengths.

Coordinated efforts among households, communities, local and international NGOs, government agencies, the private sector, and bilateral and multilateral donor agencies are key to developing and implementing effective strategies. Partnerships also need to be forged with sectors other than the health sector. These may include the ministries of education, trade, agriculture, or NGOs working in these areas. Partnerships are important, but they also require time and energy to build and develop.

Key principles/elements of effective partnerships:

Presented below are some of the key elements of partnerships.

- There is a clearly shared vision, such as reducing fetal-neonatal and maternal deaths.
- Benefits and expectations of the partnership are known by all parties.
- Boundaries are clear on both sides.
- There is a shared understanding that an intervention requires time and resources to be successful.
- There is mutual transparency, respect, and trust.
- Credit is shared.
- Successes and failures are examined, and lessons are applied.

2. Empowering communities

What are communities? Communities are not stagnant entities but are constantly evolving in response to change. Community empowerment is a process by which communities proceed to assume more control for their own health practices and services. Program designs, in partnership with communities, must take into account community resources when selecting interventions and planning implementation. Community systems designed to improve access to maternal and fetal-neonatal health services need to be location-specific and deal with the main constraints in that setting.

Why work with communities? First, communities, households, and individuals are the primary caretakers of their health. The more information and access to services they have, the greater the likelihood that their health status can be improved. In many settings, communities have practices that may be beneficial but are not accepted by formal health providers. Second, most of the world's maternal and fetal-neonatal deaths occur in the community. The communities may not be aware of the problems, or they may believe that they can not make a difference. Third, the responsibility for solving problems ultimately lies with the communities, households, and women themselves. Fourth, communities have strengths and resources available that may be a key component in problem-solving.

How to work with communities: There is no magic formula for working with communities. It is a long-term process. Success depends on two factors:

- the approach undertaken and the attitude with which it is carried out; and
- the appropriate use of selected approaches and tools (i.e., community self-diagnosis).

Information can be collected about the community through a variety of quantitative and qualitative research methods. The use of participatory tools can provide richer data and may give the community an active role in the decision-making process. Participatory methodologies, such as participatory rural appraisal (PRA), participatory learning in action (PLA), or the Warmi approach developed by MotherCare/Save the Children in Bolivia, can promote community involvement among a variety of opinion leaders.

As stated previously, the informal and intersectoral sectors of the HCDS need to be actively involved in all four steps of the Program Management Cycle. There must be a two-way dialogue with all the HCDS sectors to understand priorities, identify ways to solve their problems, and ultimately achieve the highest level of health attainable in that setting.

Table 3.15 outlines key factors to consider when working with communities. Table 3.16 summarizes some successful and uncessful approaches for addressing the community. Panel 3.1 provides a story of a rural community in Bolivia where community empowerment has a dramatic effect on perinatal mortality.

TABLE 3.15
FACTORS TO CONSIDER WHEN WORKING WITH COMMUNITIES

- **Treat everyone with respect** and dignity and meet the community where they are.
- **Reversal of learning.** Go as a student rather than a teacher (there are many things that the community members can teach us, even if they are not literate). Program managers and health providers often have certain perceptions about the communities. To be effective, we need to be aware of our knowledge, attitudes, and practices. Many health practices are used because they are more convenient for the provider than for the client (i.e., a woman's lying on her back to deliver. This position is easier for the provider, but it doesn't facilitate the delivery process).
- **Supportive environment for discussion.** Create an open environment for discussion (i.e., not blaming or being judgmental).
- **Actively listen.** There is a difference between actively listening and hearing. With hearing, you may or may not understand what is being said. You may think you heard what someone said, but it is possible that you influenced it with your own biases. Actively listening means that you listen to what is said (even if it is different from what you believe) and probe deeper to understand what a person means.
- **Seek diversity.** It is rare that communities are homogenous. Men probably have different views than women, as might young and old people, people with land and those without, and people of different religious or ethnic groups. Since they are all members of the community, it is important to listen to all of them. Often, the program manager must make a special effort to collect this information because some may not be represented among the key stakeholders (i.e., minority and marginalized groups)
- **Discuss how the problem can be solved jointly.** Communities have access to resources and know what programs have been tried and have failed in the past. They are key to developing feasible, sustainable solutions.

Source: Fuerstein, 1993.

TABLE 3.16
SUCCESSFUL AND UNSUCCESSFUL APPROACHES FOR ADDRESSING THE COMMUNITY REALITY

AREA	COMMUNITY REALITY	SUCCESSFUL APPROACHES	UNSUCCESSFUL APPROACHES
Knowledge	The community may lack knowledge and be illiterate but that does not mean they are not willing to learn.	What do they know already? How can we learn about their culture and traditional practices?	What do we have to teach them? We have to teach them everything because they do not know anything.
Attitudes	Communities have a key role to play in promoting maternal and fetal-neonatal health, particularly in addressing some of the delays in accessing care.	Some of the practices may be harmful, but others may be beneficial.	
Skills	Women like to deliver at home. They feel more comfortable, and it is the natural way. Traditional birth attendants have delivered babies for centuries with great success.	How can we make women feel more comfortable when they come to the health facility? What practices and skills can be built upon?	Women should deliver in hospitals because it is better for them. The community has nothing to contribute. We have to develop their skills from scratch.
Behaviors	Women like to deliver in a squatting position. It is better for the baby and easier on the mother. We bury the placenta as a sign to our God that the baby has been born.	Each woman is an individual, and she should decide which position is the best for her. We need to learn more about the way women deliver at home.	All women in a facility will deliver in a maternity bed and on their back because it is the best position for them. We need to assess the placenta and dispose of it because it is dirty.
Resources	Community members donate their time and labor. Communities have access to development funds. Communities have access to funds from other sectors (i.e., transportation).	Community members have access to resources.	Communities are very poor. They do not have access to any resources.

PANEL 3.1
LESSONS LEARNED

REDUCING PERINATAL MORTALITY IN RURAL BOLIVIA

Aymara, with a population of 15,000, is a remote and isolated area with a maternal mortality ratio of over 1,000 per 100,000 live births and a perinatal mortality rate of 103 per 1,000 births. The three health posts lacked equipment, supplies, and skilled personnel to manage obstetric complications. Traditional birth attendants were not available, and husbands were the main providers of care during labor.

A project with MotherCare and Save the Children formed women's groups and introduced a simple model for community-level problem-solving that involved four steps:

1. identification and prioritization of problems;
2. group development of an action plan;
3. implementation of group plans; and
4. evaluation.

Activities included raising community awareness of maternal and fetal-neonatal health issues and using radios, flip charts, booklets, and a home-based woman's health card to teach simple delivery and fetal-neonatal care and danger signs. The community identified an individual to be responsible for drying the baby, cutting the cord, and promoting breastfeeding. Family planning services were provided in collaboration with a local NGO.

Over half the women in the 52 communities participated between 1991 and 1993, and the PMR dropped from 75 to 31 per 1,000 in 2 years, mostly due to a reduction in deaths on the first day of life. There was an increase in attendance at antenatal and postnatal services, use of trained birth attendants, tetanus immunization coverage, and consumption of iron and folic acid. Family planning coverage increased from 0% to 27%. A reduction in MMR was not documented.

Source: O'Rourke K, Howard-Grabman L, Seoane G. Impact of community organization of women on perinatal outcomes in rural Bolivia. Rev Panam Salud Publica. 1998.

More details are available on the CD-ROM, including the CARE manual "Embracing Participation," which includes tools and field examples of reproductive health programs.

3. Promoting healthy behaviors

Information, education, and communication activities are important to increase knowledge. However, this is only the first step in behavioral change. A message directed at a population does not necessarily result in healthier behavior. There has been a wealth of research in behavioral change that is now being applied more widely in international field settings. Behavioral changes typically occur in four stages (Table 3.17).

TABLE 3.17
THE FOUR STAGES OF BEHAVIORAL CHANGE

STAGE	DESCRIPTION OF STAGE	EXAMPLE
Precontemplation.	Not personally considering this behavior.	Has never considered family planning.
Contemplation (awareness, knowledge, and attitudes).	Considering this behavior. Weighing balance of benefits and barriers.	Considering family planning, but barriers include long distance to health facility, user fees, and opposition of husband.
Action (change behavior once).	Started to practice this behavior but not necessarily consistently.	New acceptor of family planning.
Maintenance (continue health behavior).	Practice this behavior consistently.	Consistent user of family planning method.

Source: Adapted from Prochaska J et al. in Health Behavior and Health Education, Theory, practice and research, 1997.

Research indicates four key areas to successful behavioral change programs:

- clear definition of the problem;
- careful selection of the target audience(s);
- assessment of the target audience's current knowledge and behaviors; and
- well-researched and designed message.

Clear definition of the problem: The more specific the problem definition is, the easier it will be to identify the primary and secondary target audiences. This will also assist in developing an appropriate message.

Careful selection of audiences: While careful selection of the primary target audience is important, successful behavioral change programs have found that change is more likely if several additional audiences are involved. Thus, the program manager and stakeholders need to identify the primary target audience as well as other key people (secondary target audience) who are necessary to support the behavioral change. For example, to promote early exclusive breastfeeding, the primary audience may be mothers, but secondary audiences may be mothers-in-law, husbands, and TBAs.

Another important target audience is health personnel. Studies have shown that a significant proportion of women do not access health services because staff members either ignore them or treat them rudely. Many providers have never received training in interpersonal communication, counseling skills, or appropriate use of behavioral change communication materials. Behavioral change strategies need to focus on changes in the providers' skills as well as in their attitudes and demeanor. Health provider training must include instruction about how to use educational materials in the most effective manner to promote behavioral change among clients.

Assessment of audience's current knowledge and behaviors: The key to a well-designed message is to assess the target audience's current knowledge and practices. Knowing your audience is critical to designing an appropriate message.

TABLE 3.18
ASSESSING AUDIENCES' KNOWLEDGE AND BEHAVIORS: EXAMPLE EARLY BREASTFEEDING

AREA TO BE ASSESSED	CURRENT SITUATION
What do they already know?	They have been told Colostrum is bad for the baby.
What do they do regarding this practice? (Women express colostrum and throw it away. They think it is bad.)	They think it causes jaundice in the baby.
Are they thinking of changing behavior?	Not yet.
What are the advantages and disadvantages of changing their behavior?	Advantage is that reduction in neonatal deaths. The disadvantage is that it is not socially accepted.
Are there groups and support to promote and maintain the healthy behavior change?	Village health workers.

Well-researched and designed messages: Once it is clear what the audience thinks about the targeted behavior, a message can be crafted. The message content should:

- be appropriate for and relevant to the level of the target audience;
- describe the advantages and benefits; and
- be action-orientated.

There are many possible channels by which to deliver a message. It is usually more effective to use several channels (i.e., MOH facilities, schools, restaurants, women's groups) with reinforcing messages for the different target audiences. In addition, the message can be delivered through various media, including songs, puppet shows, skits, printed materials (such as posters and flipcharts), radio, television, or video.

Pre-testing, a process whereby concepts and draft messages are reviewed by representatives of the target audiences, is essential. This process gives insight into the appropriateness of the message (i.e., cultural appropriateness, effectiveness of message). Offensive or misunderstood messages can do more harm than good. For example, in Tajikistan, a poster was developed to promote use of iron tablets during pregnancy, but the beautiful woman in the poster did not have her head covered. This was offensive to local women. It is also important to have a health professional examine the technical accuracy of the message.

Table 3.19 outlines some of the key behavioral objectives to improve maternal and newborn health.

Panel 3.2 summarizes an imaginative and culturally sensitive behavior change program in Mali.

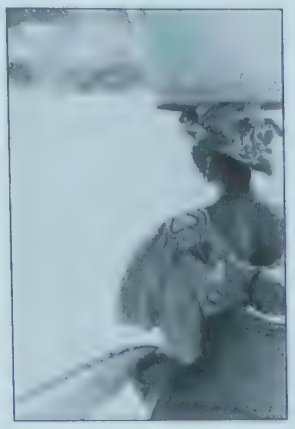
TABLE 3.19
BEHAVIORAL GOALS FOR MATERNAL AND FETAL-NEONATAL HEALTH

TARGET AUDIENCE	BEHAVIORAL GOALS
Pregnant women and mothers	• Seek care at least four times during pregnancy. • Complete ANC regimens (i.e., IFA, treatment of infectious diseases, tetanus toxoid immunization). • Plan for childbirth (place, attendant, transportation, money, blood donor). • Follow good self-care practices, avoid harmful practices, and make appropriate use of available health services. *Where there is no skilled attendant at most births:* Recognize obstetric and neonatal problems during pregnancy, childbirth, and the post-partum period. *Where there is a skilled attendant at most births:* Follow the skilled provider's advice to seek care in a timely manner during pregnancy, childbirth, and the post-partum period.
Communities	• Foster awareness among women, their families, and communities of obstetrical problems and risk-reduction behaviors (i.e., delay the first pregnancy, practice birth spacing, limit family size). • Participate in the management and improvement of local health services, create feedback mechanisms (i.e., stakeholder committees). • Facilitate communication and transportation links for women and fetal-neonates with emergencies.
Health workers	• Provide quality, client-centered care to women and fetal-neonates who seek services and use positive interpersonal skills to assist women and families in a respectful, culturally appropriate, and responsive manner. • Encourage women to deliver with a skilled attendant. • Provide quality ANC services, including detection and treatment of common infections (STIs, malaria, hookworm), promotion of appropriate nutrition, and counseling about birth planning. • Provide quality delivery services, including detection and treatment of complications and, if needed, prompt referral to an appropriate facility. • Provide quality post-partum care services for both the mother and the fetal-neonate.
Policy makers	• Make and support policies or norms that endorse the establishment of quality, client-centered, essential obstetric care services. • Provide reasonable funding for program efforts to improve maternal and fetal-neonatal health services. • Support baby-friendly hospital initiatives to promote breastfeeding in institutions and enforce the international code for marketing of breast milk substitutes.

Source: Adapted extensively from unpublished document of CHANGE Project, 1999.

PANEL 3.2
LESSONS LEARNED

THE GREEN PENDELU IN MALI: ALTERING COMMUNITY ATTITUDES TO PREGNANCY



A community-based project in Dioro, Mali, found that a key barrier to improving maternal health-seeking behavior during pregnancy was the embarrassment that both men and women felt while discussing pregnancy. Knowledge of the local culture identified the significance of the pendelu, a short cloth undergarment worn only by married women, which is a symbol of marital roles and privileges.

The intervention involved a modified pendelu, dyed green, to symbolize a women's pregnancy and the role of her husband as the protector. A song was developed involving the green pendelu and teaching about danger signs in pregnancy, the need for health care, and the role of the husband in encouraging healthy pregnancy for his wife. The song was performed at assemblies by the local Griot (an oral historian/educator/entertainer).

This simple intervention resulted in a more positive approach to pregnancy. Almost all pregnant women wore the green pendelu. Husband-wife communication about pregnancy increased dramatically from 3 percent to 66 percent. One-third of husbands said that they would lighten their wife's workload if she was wearing a green pendelu, and half said that they would make sure she got good nutrition.

Source: Adapted from "Turning the Ordinary into the Extraordinary: the Green Pendelu in Mali."

4. Building capable institutions

All countries have some health system capacity with facilities and personnel, even if the disparities worldwide are striking. However, in many countries, improving access to maternal and fetal-neonatal health services has not been a priority. Upgrading existing facilities and skills of health personnel, often for relatively low costs, can make significant improvements in the quality of services and maternal and fetal-neonatal outcomes. A capable institution meets a set standard for performance given its purpose and setting. For example, an institution, such as a health center, that is not intended to provide cesarean-sections would not be assessed on its cesarean-section rate. More details on assessing performance are given in Step 2 of Part Three. Strengthening capacity involves improving the whole system, and the key supports of this system are standards for practice, skilled staff, and supplies. Table 3.20 provides characteristics of capable institutions.

TABLE 3.20
CHARACTERISTICS OF CAPABLE INSTITUTIONS

CHARACTERISTICS OF CAPABLE INSTITUTIONS	AREA	ACTIVITIES
Goal: Provision of high-quality information and services.	Standards of care.	Determine the standard of care (i.e., national and international guidelines and protocols). Locally adapted guidelines for provision of clinical services. • What should be done? (protocols for examination, investigation, and treatment) • When it should be done? (particular emphasis on timeliness) • Where it should be done? (emphasis on dignity and privacy) • What is required? (staffing ratios, equipment, drugs, etc.)
Strengthening capacity of human resources.	Appropriate deployment and compensation.	Develop job descriptions, regularly assess job performance. Have clear guidelines for what health workers should do in a given situation.
	Training for effective performance.	Provide training for health workers to learn and practice their skills until they are competent to appropriately manage obstetric and fetal-neonatal complications.
	Continuing education.	
	Supportive supervision.	Continue to supervise or "support-a- vise" staff.
Managing and using information.	Data collection system.	Routine collection of selected data, and use of data at the management level as well as reporting up the system. This may include outcome data, cause-specific data, and process indicators. Within an institution, it may include audit of maternal and fetal-neonatal deaths or "near misses."
	Accounting system.	System for budgeting and collecting and reporting on financial inputs and outputs.
Effective management systems.	Consistent drug supply. Basic equipment in working order. Stock of drugs.	Inventory management plan, regular physical inventories, forecasting.

5. Advocating for supportive public policies

Although many countries have Safe Motherhood and Child Survival policies, few have specific policies addressing fetal-neonatal mortality. Many policymakers are unaware or misinformed. Thus, they do not view maternal or fetal-neonatal mortality and morbidity as a problem or a priority.

Politicians and officials make key decisions about budget allocations, infrastructure, and staffing patterns. It is important to build constituencies that support neonatal efforts at various levels (i.e., elected leaders at the national and local levels, religious leaders). These leaders need to understand the following:

- the magnitude of the problem and the impact of a maternal or fetal neonatal death on the community and family;
- interventions that can address the problem;
- actions that can be taken by the community and families to have favorable maternal and fetal-neonatal outcomes; and
- the importance of women's participating in the decision-making processes about health-seeking practices.

Advocacy is important, but it is difficult to make persuasive arguments without good data. Improvements in the information systems and use of data can increase the awareness in policymakers and program planners of the importance of the issues. Without this knowledge and subsequent political commitment to the issues, other efforts, such as changing laws or budget allocations, will be virtually impossible. Program managers need to be educated about the role of advocacy and how they can incorporate it into their current work. They can also play a vital role in the data collection, analysis, and feedback mechanisms. The health staff can use this information to make decisions to improve service delivery and to advocate on their own behalf. The global community needs to come together to support a systems approach to address maternal and fetal-neonatal deaths.

More details are available on the CD-ROM, including the CARE manual "Advocacy Tools and Guidelines: Promoting Policy Change."

STEP 3b IMPLEMENT INTERVENTIONS

SUMMARY

What is an implementation strategy?

It is a strategy to effectively implement the right interventions in the right way, with comprehensive planning, management, and use of cross-cutting strategies.

Was the appropriate information used to design the implementation plan?

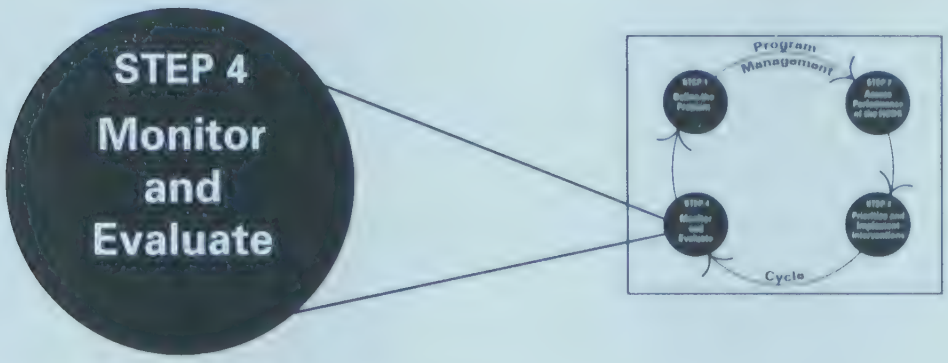
An implementation strategy should answer these questions:

- **What is the goal?** What is our overall vision?
- **What are the objectives?** Exactly what do we plan to achieve?
- **What interventions will achieve our objectives?**
- **Where?** Which sectors of the HCDS will be involved and in what geographic location?
- **By whom?** Who will be involved in implementing or supporting the implementation of the interventions?
- **When?** How often will the interventions be provided?
- **Cost?** What is the budget for the strategy?
- **How?** How will the interventions be implemented with the participation of key stakeholders?

What are the key strategies for implementing interventions?

- Creating partnership.
- Empowering communities.
- Promoting healthy behaviors.
- Building capable institutions.
- Advocating for supportive policies.

STEP 4 MONITOR PROGRESS AND EVALUATE OUTCOMES



A. Summary of Steps 1, 2, 3a, and 3b

B. What are monitoring and evaluation?

C. Using indicators

D. How to select indicators in the local HMIS

E. How can information be used to monitor and evaluate maternal and newborn programming?

Summary of Step 4



TERMINOLOGY FOR PART THREE

STEP FOUR

5 A's indicators: A measurement that provides information about the availability, accessibility, acceptability, affordability, and appropriateness of an intervention.

Goal: A generalized statement expressing a program's intended effect on one or more health problems.

Evaluation: A comparison of an outcome indicator to a preset objective; measures the changes and results of interventions.

Impact: An effect on a population to reduce an undesirable outcome (i.e., death) brought about by an intervention.

Impact indicator: A measurement that provides information about a direct determinant of a problem on a population brought about by an intervention. An example is age at first pregnancy.

Indicator: A measurement that, when compared to either a standard or a desired level of achievement, provides information about a health outcome or management process.

Indicator matrix: A flow diagram that connects the different types of indicators in an outcome-impact-sequence model with BABIES.

Input indicator: A measurement that provides information about resource input including money, manpower, materials, and methods. An example is the number of neonatal resuscitation dummies supplied.

Local indicator process: A series of interrelated activities involving all of the stakeholders that produces a set of outcome, impact, and process indicators for a local situation.

Monitoring: An on-going system of data collection and tracking that provides a program manager with information to make management decisions.

Outcome indicator: A measurement that provides information about a change in a significant result that reflects health status. An example is neonatal mortality.

Output indicator: Measurements of the results of expenditure of resources. Output indicator categories include: coverage, number of people trained, number of facilities, changes in knowledge, etc.

Process indicator: A measurement that provides information about activities or contributing factors that influence the level of the determinants in an intervention strategy. Process indicators are intermediate measures used during the course of implementing an intervention strategy to provide assurance that, if activities are conducted correctly, health outcomes will improve. An example is contraceptive prevalence rate.

A. Summary of Steps 1, 2, 3a, and 3b

At this point, the program manager and stakeholders have:

- identified the key problem "Opportunity Gap;"
- assessed the performance of the HCDS, with respect to the problem;
- prioritized and selected interventions; and
- developed an implementation plan.

Two new questions now need to be asked. The first question is, *How do we measure if the program is working well?* The second question is, *How do we assess if the interventions were successful?* A monitoring system must be developed to track processes and guide management decisions. Periodic evaluations need to be undertaken to assess performance at the health outcome level (i.e., reduction in newborn mortality).

Step 4, monitoring progress and evaluating outcomes, completes the program management cycle. This step provides a set of guidelines to assist program managers in maintaining a course of action that is consistent with the program's stated outcome objectives. The result of Step 4 is a redefinition of both the health problem and an assessment of the program management cycle. This step's output is the input to the continuing cycle of program improvement.

This manual adapts the CDC/CARE monitoring and evaluation guidelines into a tri-level monitoring and evaluation procedure with three major types of indicators *(process, impact, and outcome)* (Table 3.22). These will be described later in this section. In its simplest form, this procedure is an if-then logic model. *If the program performs the right evidence-based activities in the right way, then there will be a positive effect on a health problem that should alleviate the health problem.* This procedure assists the program manager in locating the source of trouble, if a program does not achieve its expected outcome.

The *process-impact-outcome* linkage reduces the chance of outcome displacement (achieving change in process but not in health outcome) by keeping attention focused on the health outcome. Every program needs an opportunity to succeed; if it cannot succeed in terms of outcome, it will shift its objectives to those it can achieve. The process then becomes the purpose, and input becomes the surrogate for output. "Health" becomes equivalent to "equal access to medicine."

B. What are monitoring and evaluation?

The terms monitoring and evaluation are often used interchangeably, but they have different meanings. The main differences between the two are highlighted in Table 3.21.

TABLE 3.21
DIFFERENCES BETWEEN MONITORING AND EVALUATION

	MONITORING	EVALUATION
Focus	Process indicators: provide feedback about implementation strategies.	Outcomes: provide feedback about the results of the interventions.
How often are the data collected?	Monthly, quarterly, or semi-annually.	At least every year by program staff Every 2-3 years by external persons.
How often are the data reviewed?	Monthly, quarterly, or semi-annually.	At least every year by program staff Every 2-3 years by external persons.
Who collects and analyzes the data?	People involved in the program.	Unbiased person, external person
Implementation steps.	1. Choose a variable that will reflect what you want to measure (indicator). 2. Set objectives for the level of this indicator at a given time. 3. Compare the current level of the indicator with the objective level.	

Monitoring is an ongoing systematic process that provides information needed to make program management decisions. The monitoring system collects and tracks process indicators. This information allows the program manager to understand if the interventions are being done "the right way". Monitoring is important because it provides feedback on progress. It allows changes to be made more promptly, thereby assuring the program objectives are more likely achieved.

It should be noted, however, that processes are expected to lead to a change in outcome. Even if the process indicators have improved (i.e., testing of more pregnant women for syphilis), the outcome may not change. For example, if syphilis testing increases but women are not treated, there is probably not a reduction in stillbirths from syphilis. Therefore, both the process and outcome indicators are important for measuring progress towards a desired result.

Monitoring = process indicator compared to preset objective.

Example: Ongoing recording of the proportion of deliveries with a skilled attendant compared to a goal of 80 percent coverage at a certain date.

Evaluation is the systematic and scientific process of determining the extent to which an action or sets of actions were successful in the achievement of predetermined objectives. It involves measurement of adequacy, effectiveness, and efficiency of health services to reduce the "Opportunity Gap." Evaluations usually occur after enough time has lapsed (1-2 years) to measure changes and results of the interventions. As stated previously, evaluations focus on outcome measures and are usually conducted by external persons.

Evaluation = outcome indicator compared to preset objective
Example: Assess if neonatal mortality decreased to a certain predetermined level, such as from 50 to 40 per 1,000 live births, by a certain date.

The purpose of an evaluation is to provide information for programmatic decision-making. This information helps program managers make better decisions about health programming in their setting and determine future strategies (i.e., community-based distribution) or standards of care (i.e., oral rehydration salts). This information can also provide insight into allocation of resources (human, material, and financial).

C. From global to local indicators

What is an indicator? An indicator is a measurement that, when compared to either a standard or a desired level of achievement, provides information about a health outcome or management process. Indicators track progress (either of process or outcome). Often many indicators are selected, thereby requiring extensive data collection. However, in most settings, only a small portion of the data is used in the decision-making process. The BABIES matrix is an example of using a few pieces of data to provide significant amounts of information. It is better to select a few key indicators, measure these effectively, and use them actively in decision-making. Some types of indicators are outlined in Table 3.22. In the next section the local indicator matrix is explained as how to produce newborn indicator system.

Indicator = a measurement that, when compared to either a standard or a desired level of achievement, provides information about a health outcome or management process.

Mortality and morbidity events are measured by outcome indicators. There are specific interventions that are meant to prevent mortality and morbidity. Impact indicators measure some aspect of the intervention that is then used to monitor and evaluate the effectiveness of the intervention. Impact indicators help the program manager focus on the interventions most likely to achieve the greatest reduction in excessive mortality and morbidity.

TABLE 3.22
TYPES OF INDICATORS

TYPE	DEFINITION	EXAMPLE
Outcome	Change in significant end result reflecting health status (morbidity or mortality).	Neonatal mortality rate.
Impact	Measurements associated with interventions that are meant to prevent or treat determinants of conditions that cause mortality or morbidity.	Age at first pregnancy.
Process	Measurements of contributing factors that influence the level of the determinants of health outcomes or impact interventions. Categories include output, the 5 A's, and input.	
	Output - Measurement of the results of expenditure of resources. Output indicator categories include: coverage, number of people trained, number of facilities, changes in knowledge, etc.	Number of birth attendants that are trained. Women who know about the six cleans. Percentage of women covered with tetanus toxoid immunization. Percentage of deliveries completed with a clean delivery kit.
	5 A's - Measures of availability, accessibility, acceptability, affordability, and appropriateness	Percentage of hospitals capable of performing C-section. Percentage of women living within two km of facility capale of doing C-section (accessibility).
	Input - Resources (i.e., manpower, materials, money, methods (4 M's).	Staff for mobile outreach team for tetanus immunization.

From global to local indicators - Environmentalists have coined the phrase, "Think globally, but act locally." Recent activities of UN agencies, bilateral governmental organizations, and NGOs have developed large lists of possible indicators to be used at the global and national level for reproductive health, safe motherhood, and child survival. WHO has produced a list of 18 recommended indicators for "Making Pregnancy Safer" and guidelines on how to use them. These indicators and guidelines are on the attached CD-ROM. The MEASURE evaluation project also has many useful guides for monitoring and evaluation, and its compendium on reproductive health indicators is also on the CD-ROM.

Based on the WHO recommendations, outcome indicators for newborn health at global and national levels may include:

- neonatal mortality rate;
- late fetal death rate;
- perinatal mortality rate;
- preterm birth rate (<37 weeks);
- ratio of fresh stillbirths to macerated stillbirths;
- number of neonatal tetanus cases;
- birth weight specific neonatal mortality rate for LBW babies; and
- how birth weight rate.

Based on the WHO recommendations, process indicators for newborn health at global and national levels may include:

- % of pregnant women who receive at least two ANC visits;
- % of pregnant women who have had two or more doses of tetanus toxoid immunization;
- % of pregnant women who are appropriately screened/treated for malaria;
- % of pregnant women who are appropriately screened/treated for syphilis;
- % of pregnant women who have a maternal health card;
- % of pregnant women who know two or more newborn danger signs;
- % of institutional deliveries;
- % of deliveries with a skilled attendant at birth;
- % of women who breastfeed their baby in the first hour of life;
- % of women who exclusively breastfeed for 6 months;
- % of baby friendly hospitals; and
- % of babies who receive eye prophylaxis care.

These indicators are important for national and international decision-making but may be less relevant or less meaningful at the program level. While information should be passed "up" to the national level to follow these indicators, information from local indicators is required for local decision-making.

D. How to select indicators in the local HMIS

The process to determine local indicators must:

- be adaptable (rational but not rigid) to all newborn programs;
- allow for easily understood comparisons between programs; and
- prevent outcome displacement (defined previously).

Local indicators should be developed at the local level through a process that includes representatives from all stakeholder groups. The indicators derived in the process are an absolute necessity if quality services are to be provided. The following are the three basic principles to follow when selecting local indicators.

- Keep it simple and participatory.
  - Define clear goals and objectives.
  - Insist that data collected at the local level be usable (analyzable) at the local level.
  - Build on current systems.
  - Develop simple materials at the community level to explain the function of local indicators. Assure community understanding and involvement.
- Consider using BABIES.
  - Account for every pregnancy and weigh every newborn.
  - Perform the Gap Analyses for time, place, and person to provide focus and direction.
  - Map the indicators in the indicator matrix (explained later in the section).
- Develop quality systems.
  - Avoid outcome displacement; link BABIES to management process indicators through outcome and impact indicators.
  - Promote two-dimensional thinking at all levels of data analysis, particularly the health centers and hospitals.

1. Components of the local HMIS

The essential components of newborn HMIS were described in Part Two. Three points need to be emphasized.

- **The data collection system can drive both coverage and quality of care.** It drives coverage by insisting that there is a record to account for every woman and newborn (clinical record and, if necessary, a death certificate). It drives quality of care through the implied guidelines and services reported on the record.
- **The data currently available should be fully utilized before additional data are collected.** The features of the data (type, level of collection, timeliness of reporting, source, availability and accessibility, reliability, and usefulness) will determine whether the data are used in the local HMIS. It is better to have few pieces of data used well in local decision-making.
- **The home-based unit record[a] is the core element of the local HMIS.** The mother should keep her record, and then the newborn's record, with her at all times. A copy of this record may be maintained at the local health facility and serve as the means for data collection.

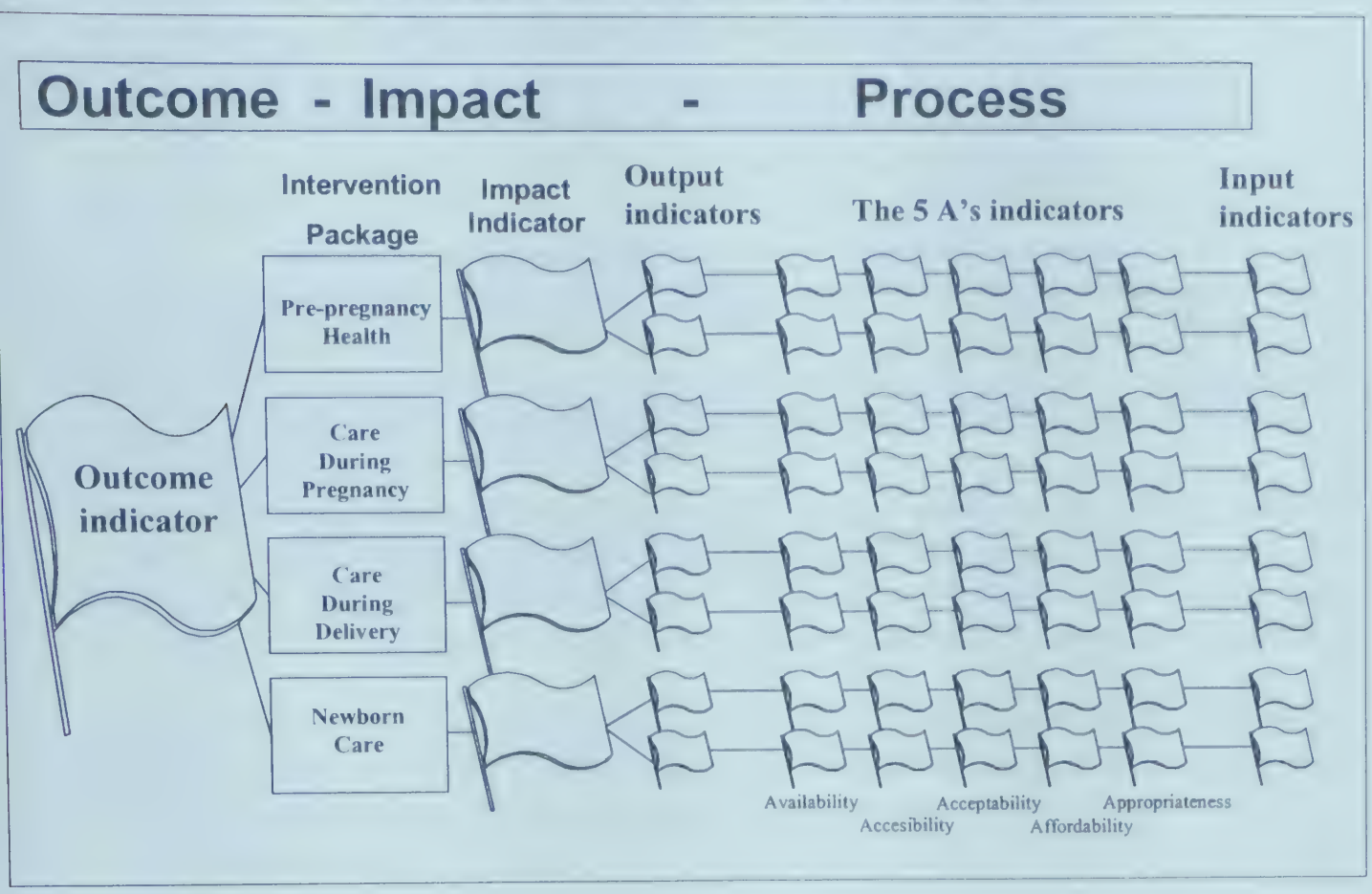
2. The local indicator matrix

The local indicator matrix is a flow diagram that connects the different types of indicators in an *outcome-impact-process* model (Figure 3.7). This manual suggests that an outcome indicator from BABIES be used at the head of the matrix. Other outcome indicators may also be substituted. For each component of the intervention packages there is an impact indicator. A process indicator may also be necessary for each impact indicator.

There are three types of process indicators. The output indicators are generic and fall into several categories of quality of services (coverage, impact, number of personnel trained, changes in community attitudes). The 5 A's represent availability, accessibility, acceptability, affordability, and appropriateness and their indicators can refer to either the intervention or a component of it. The input indicators refer to the manpower (person power), materials, money, and methods. Local quality teams have found the local indicator matrix very useful in maintaining their focus on outcome.

[a]A unit record refers to the data from a single woman and newborn, collected and stored electronically so that multiple variables from one record can be analyzed to define an indicator. Modern technology now permits the inexpensive storage and tabulation of these data.

FIGURE 3.7
PRINCIPLES OF A LOCAL INDICATOR MATRIX



3. Selecting and using local indicators

In order to complete the local indicator matrix, the program manager has to undertake the four actions presented below.

Action 1- Team Building: The program manager's first action is to form a team of local stakeholders. The team should be interdisciplinary and include all components of the HCDS. By including all stakeholders, the program manager assures consensus in the community, the lack of which is a common cause of failure when trying to implement the system and respond to information from indicators. This team is not meant to function all together, all of the time. In fact, small groups working independently on specific tasks for short periods of time are a much more effective and efficient use of time and talent. A key managerial decision is when to bring the full team together to obtain consensus. Consensus is an endorsement from the group with everyone willing to support the system even though they may not fully agree on all of the minor details. The program manager should bring the group together when there has been enough small group discussion to eliminate surprises, not necessarily disagreement, and when consensus can be achieved within a 3-hour session (morning or afternoon).

Action 2 – Select Indicators: The first task for the program manager and stakeholders is to complete the local indicator matrix for each component of BABIES. This can be done because the program manager and stakeholders have identified the key problem ("Opportunity Gap"), assessed the performance of the HCDS with respect to the problem, prioritized and selected interventions, and developed an implementation plan.

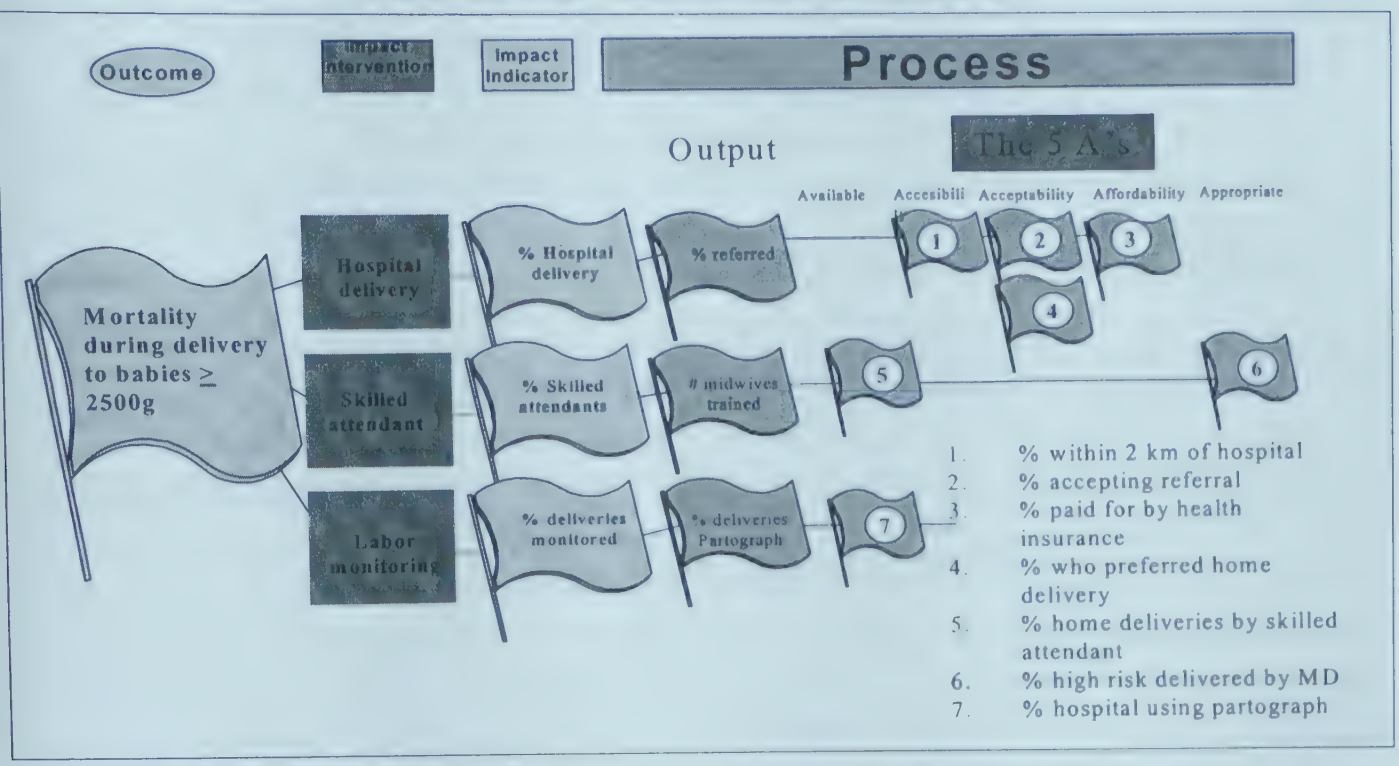
To begin the indicator selection process, the team divides into small groups and works separately for a time. They come together to compare results. There should be at least one outcome indicator and impact indicator for the intervention selected. There may be multiple impact indicators but often there are no process indicators thought to be necessary for a specific intervention. The team decides whether there is a need for any one of the 5 A's indicators. The team decides if there is a need for an input indicator. The indicator name is placed in the appropriate flag in the indicator matrix. The process is repeated until the matrix is complete. Examples of the package content and associated indicators were seen in Figures 2.10 and 2.11, respectively. A more detailed discussion of the intervention package contents will follow in Part Four. Data are used as much as possible in this step. When data are incomplete, a consensus can be used to justify the inclusion of an indicator. However, this should be done rarely and only with an accompanying plan to collect the indicator data and to assess feasibility.

Action 3 - Map the indicator matrix with the whole quality team: Mapping the local indicator matrix refers to a process that eliminates all the flags on the matrix thought to be unnecessary for each BABIES Intervention Package/Package Component. If there are four BABIES Intervention Packages, there will be four figures comparable to Figure 3.8.

Action 4 - Review the results with the whole quality team and develop a plan: Prepare presentations that can be made by the team members to all appropriate stakeholders to gain acceptance of the matrix. Prepare a plan for response, analysis, and data collection for each of the indicators. This plan should describe who will do what, where, when, and how.

Figure 3.8 is an example of the preliminary work of a quality team during a workshop on local indicator development in a Middle Eastern country. The team members focused on two cells in the BABIES matrix, care during delivery and care of the newborn for newborns weighing greater than or equal to 2,500 grams. A pilot project is underway to test the feasibility of the system. Figure 3.8 is the flowchart that depicts the indicator matrix for care during delivery for the pilot project. The team felt that three impact interventions should be monitored with an output indicator, but felt that only a certain number and type of the process indicators needed to be followed. The specific indicators are listed in the legend of the figure.

FIGURE 3.8
EXAMPLE OF LOCAL INDICATOR MATRIX FOR MORTALITY DURING DELIVERY TO BABIES ≥2500 G



E. How Can Information be Used to Monitor and Evaluate Newborn Programming?

A monitoring and evaluation plan should be developed at the beginning of a program. The plan should answer the following questions.

1) What indicators will be measured?
2) Which source(s) will provide the data?
3) How often will the data be collected?
4) Who will collect and analyze the data?
5) What is the anticipated response in the program when changes in the data are observed?
6) How can key stakeholders participate in the HMIS?

1. What indicators will be measured?

The indicators chosen should relate to the information needed to manage the local program and to measure its effectiveness. The outcome indicators will be determined by the objectives of the intervention as outlined in the countermeasure matrix. For example, if the objective is to reduce neonatal tetanus deaths by 50 percent in five years, deaths from neonatal tetanus must be recognized and counted. The monitoring indictors will reflect the process of the activities. For example, in the neonatal tetanus program, the activities may be tetanus toxoid immunization of pregnant women and clean delivery kit promotion. Thus, the process indicators might be TT2 coverage in pregnant women and percentage of deliveries completed with a clean delivery kit.

LEVELS OF MEASUREMENT

- Individual mother or baby.
- Health care facility.
- District or program area.
- National.
- Regional.
- Global level.

Many sources of data appropriate for low resource settings have been outlines in Part Two (Page 2.31) including the following:

- a home-based maternal/newborn record;
- a community monitoring board;
- birth registers for institutional/health center deliveries; and
- verbal autopsies.

2. Which source(s) will provide the data?

Data can be collected and measured at many different levels, ranging from evaluation of individual deaths or adverse outcomes (i.e., perinatal audit) to the global level. The level of measurement depends upon the level on which the data will be used. Unfortunately, data are often collected and passed to the next level without guiding decision-making at the local level.

3. How often will the data be collected?

How often local indicators are collected is a local decision. Certain process indicators may need to be collected frequently to guide programmatic decision-making. For example, the number of women prescribed syphilis treatment will have implications for how much penicillin to order to avoid a stock-out. Outcome indicators may be collected annually, unless a BABIES community monitoring board is used . This is most often updated monthly.

4. Who will collect and analyze the data?

Part of the monitoring and evaluation plan that is often neglected or underestimated is the need to commit personnel time to data collection and analysis. The person or people responsible for collecting certain pieces of data should be clearly understood, and they should be trained in collection, recording, and analysis as necessary. Part Two gives more details on collection and use of data, and the CD-ROM includes texts on epidemiology and access to software for data entry and analysis.

5. What is the anticipated response in the program when changes in the data are observed?

Program managers often find themselves in a constant mode of reacting rather than acting on data. This situation can be avoided by a thoughtful process that starts with the decisions known to be taken routinely and the development of a plan to respond to data before a crisis develops. By working in the counter-clockwise fashion described in Part Two, Section III, the program manger can avoid such dilemmas.

A way of thinking for monitoring and evaluation – Program managers need to know regularly if the program is working well, and if the interventions were successful in reducing the "Opportunity Gap." Local indicators must track processes, assess performance, guide interim management decisions, and be linked to periodic evaluations undertaken to determine if health outcomes are improving. Local indicators should also allow a program manager to continually test the validity, reliability, and completeness of the intervention strategy from both an individual patient and programmatic viewpoint.

In the monitoring and evaluation thought process, the two most important questions to be answered in Step 4 are:

Is the program doing things right? (Monitoring process)
Is the program doing the right things? (Evaluating outcome)

The first question refers to the performance of activities and is monitored by process indicators. Process indicators can vary for two reasons—lack of resources and lack of performance. The lack of resources requires the program manager either to lower expectations or to identify additional resources. The lack of performance requires the program manager to reassess the program personnel in terms of motivation, skill, and knowledge. If lack of performance is the problem, the program manager has four options: hire, fire, train, or motivate.

The second question refers to the improvement in outcomes. Outcome indicators are used to measures the program's effectiveness. If outcome indicators are not reduced, either the wrong thing was done or the interventions known to be effective were not managed or conducted properly. (Program managers need to be cautious about the last statement. Since registration of stillbirths and newborn deaths is routinely underreported, many newborn programs experience an initial rise in the outcome indicators due to more complete coverage of the population and a capturing of more stillbirths and neonatal deaths.) If the status quo or the worsening of the outcome indicator is true, then a program may turn out to be less effective than planned for the following reasons: lack of resources to accomplish activities, lack of personnel performance to accomplish activities, invalid assumptions regarding the linkage of specific activities with the impact interventions, or invalid assumptions linking impact interventions with outcome. The latter occurs when non-evidence-based interventions are employed.

An integral part of any program is the development of measurable checkpoints or milestones in both time and direction. These directional indicators assist the program manager in assessing periodically whether the program is moving in the right direction and if it is expected to arrive on time. Interim evaluations may rely on process indicators, but the proof of success is in the outcome indicators.

Continually evaluating the effectiveness of a program is the most important thing the local indicators do. It is more important than making sure things are done right. Hence, it is more important to answer the question,

Is the program doing the right things?

The if-then logic model for this question has the following sequence:

- **If** the impact indicators are not moving in a positive direction but the process indicators are, **then** the program manager must re-examine the assumed relationship between contributing factors and the determinants, revise the intervention strategy, and develop a new work plan.

- **If** the expected outcome indicator is changing in the appropriate direction, but the impact indicator is not, **then** the program manager must reexamine the assumed linkage between the impact intervention and the health problem, revise the intervention strategy, and develop a new work plan.

- **If** the program is doing things right (i.e., activities and process indicators are moving in a positive direction) but the impact and outcome indicators are not achieving the projected changes, **then** one conclusion is that the program is not doing the right things.

- **If** the outcome indicator is changing positively, **then** the program manager must reassess the need for the program and begin the program management cycle again.

6. How can key stakeholders participate in developing the local indicators of the HMIS?

Key stakeholders must participate in the design of the HMIS and the choice of indicators. Stakeholders can be involved in data collection through focus groups (as participants or collectors) or exit interviews. They can also participate in the review of data analysis. Understanding both the process and outcome results empowers all the key stakeholders to participate actively in programmatic decision-making.

A process to ensure participation of key stakeholders in the development of local indicators should include activities to achieve:

- participation of all team members on the team to develop the indicator matrix in order to ensure ownership of the process to develop outcome, impact and process indicators;
- joint development of standards, service procedures, protocols, and guidelines;
- joint development of a monitoring and evaluation plan based on the major problems and concerns perceived by the community and the health care personnel;
- involvement of the community in data collection and analysis;
- creation of feedback mechanisms that reflect the concerns of all stakeholders; and
- support for action in response to problems.

STEP 4

MONITOR PROGRESS AND EVALUATE OUTCOMES

SUMMARY

Monitoring is an ongoing systematic process that provides information to make program management decisions. The monitoring system collects and tracks process indicators.

Evaluation is the systematic and scientific process of determining the extent to which an action or sets of actions were successful in the achievement of predetermined objectives. It involves measurement of adequacy, effectiveness, and efficiency of health services to reduce the "Opportunity Gap."

An **indicator** is a measurement that, when compared to either a standard or a desired level of achievement, provides information about a health outcome or management process. **An indicator matrix** is a flow diagram that connects the different types of indicators in an outcome-impact-process model. The **local indicator process** is a series of interrelated activities involving all stakeholders that produces a set of outcome, impact, and process indicators.

In the local indicator thought process, the two most important questions to be answered in Step 4 are:

Is the program doing things right? (Monitoring process)
Is the program doing the right things? (Evaluating outcome)

The essential elements in a local indicator system include the following.

- Every woman has a record of initial contact and an attempt is made to account for every pregnancy.
- Every birth has the mother accounted for and the newborn birth weight (or surrogate) measured.
- The local indicators are derived from the local BABIES matrix.
- In the local indicator system, maternal and perinatal death events should automatically trigger reviews that involve representatives from all of the stakeholders and are the basis for facility and district performance assessments.
- The process for determining district-specific indicators should be present in every district, and the training in the translation of data into information should be available in every district in at least a home-based course for health workers.

There are three basic principles to follow when developing a local indicator system.

- Keep it simple and participatory.
- Consider using BABIES from the start.
- Develop quality systems.

There are four actions in the development of indicators of an HMIS.

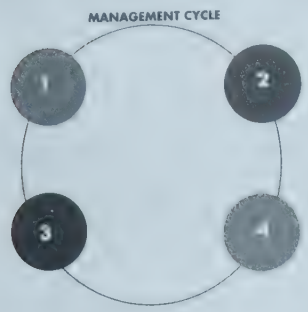
- Form a qualityteam.
- Select indicators.
- Map the indicator matrix.
- Review the results with the whole team and develop a plan.

How is information used to monitor and evaluate newborn programs? The following questions should be asked and answered.

- What indicators will be measured?
- Which sources will provide the data?
- How often will the data be collected?
- Who will collect and analyze the data?
- What is the anticipated response in the program when changes in the data are observed?
- How can key stakeholders be involved?

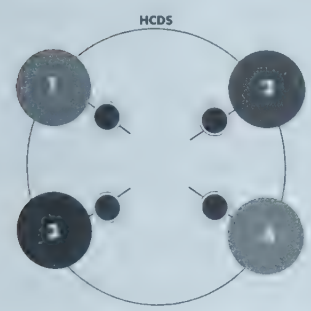
III. SUMMARY: STEP-BY-STEP

The Introduction described the four main principles upon which effective newborn health programming depends. The programming model brings together all of these principles through the three key systems presented below with BABIES at its core.



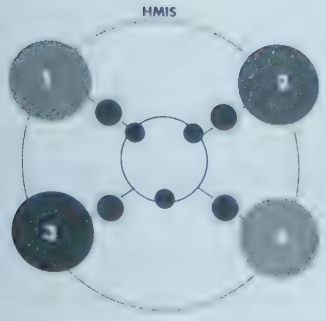
Program Management Cycle: This cycle is a step-by-step approach which helps the program manager define the problem, assess performance of the HCDS, prioritize and implement interventions, and monitor and evaluate results. This approach involves key stakeholders and uses data that are translated into information to systematically address local newborn health problems. The key actions and tasks for each step are outlined in Table 3.23.

The four-step cycle is not intended to end after the program manager and stakeholders have gone through the process once. This is an iterative process, to be used again and again. Each successive cycle will identify new problems, thus raising the program to a higher level of success through continual quality improvement, with the eventual disappearance of the "Opportunity Gap."



Health Care Delivery System (HCDS): This system is composed of three sectors – the informal/community components, the formal health care component, the intersectoral component – represented by the three concentric circles.

In order for the "Opportunity Gap" to be addressed, each component of the HCDS needs to be included in every step of the program management cycle. This approach defines the HCDS as a group of interrelated components that operate as a whole. The HCDS must come together to function in an effective and efficient manner if the program is expected to achieve its objectives. The level of available resources in each component in terms of manpower, materials, management skills, and money needs to be identified, assessed, and used in the planning of a program. It is important to include strategies, tasks, and responsibilities of each HCDS component in every program plan. Special efforts should be made to include the community.



HMIS: The core component of the program management cycle is an adaptable HMIS. Many HMISs focus solely on process-oriented indicators. They have displaced health outcome indicators with process indicators to assure program success. They have also developed as vertical programs designed to support national programs. They do not support local decision-making capabilities that are more likely to directly influence the quality of services provided to an individual mother and baby. With the more recent decentralization trend, local program managers require the knowledge, skills, and resources to develop and use adaptable, responsive, cost efficient, yet simple HMISs. The local indicator system can be designed to supply the data needed for district, region, and country level decision-making information for programmatic decisions.



BABIES: BABIES is an important core element of the local HMIS for newborn health – therefore, the symbol is placed in the center of the programming model. Using the BABIES matrix, the program managers and stakeholders can define their problem(s), assess the performance of the HCDS, prioritize and implement effective interventions, and monitor and evaluate their success. The BABIES outcome indicators of birth weight mortality rates have both maternal and perinatal meaning.

This information can help the program manager determine the right things to do. Its use enables the indicator system to be outcome driven, yet serves as a programmatic link to the intervention packages and their process-oriented indicators in a logical and easily understood manner. This helps the program manager determine whether things are being done right in the local setting. This process enables all the components of the HCDS to use outcome and process indicators that are locally determined for program management, but still serves the needs at the regional, national, and international levels for informed decision-making.

TABLE 3.23
SUMMARY OF THE FOUR-STEP PROGRAM MANAGEMENT CYCLE WITH USEFUL TOOLS FOR EACH STEP

	HOW DO I INVOLVE STAKEHOLDERS?	HOW DO I USE INFORMATION TO CARRY OUT THIS STEP?	WHAT TOOLS ARE USEFUL FOR THIS STEP?
Step 1: Define the fetal-neonatal problem	Identify key stakeholders and form a team. Participate in meetings. Review data together. Develop a plan for participation.	Collect and examine existing and new data about fetal-neonatal deaths or specific conditions. Compare local results with a standard ("Opportunity Gap"). Understand the "Opportunity Gap" for your population (who? where? when? why?). Identify the root causes.	BABIES to identify causal group (i.e., care during delivery). Use birth weight proportionate mortality rates. Epidemiology to give rates and description (who? when? why?). Qualitative methods (i.e., focus groups) to assess underlying causes. Health fishbone diagram to identify root causes.
Step 2: Assess performance of the HCDS	Assess if the core interventions are in place, accessible, affordable, and acceptable for clients. Assess client satisfaction of services.	Are the right interventions in place? What is the coverage of the "right" interventions? Are these interventions being done in the right way? • What is supposed to happen? • What do people think is happening? • What do people say is happening? • What is actually happening?	BABIES to identify potential services that are not being done right. Use birth weight specific mortality rates. Spider web to assess if core interventions are in place. Integrated health facility assessment to assess infrastructure, including standards for care, staff skills, drugs, and equipment. Quality tools, such as management fishbone diagram and histograms, to assess underlying reasons for poor performance.

TABLE 3.23
SUMMARY OF THE FOUR-STEP PROGRAM MANAGEMENT CYCLE WITH USEFUL TOOLS FOR EACH STEP (CONT.)

	HOW DO I INVOLVE STAKEHOLDERS?	HOW DO I USE INFORMATION TO CARRY OUT THIS STEP?	WHAT TOOLS ARE USEFUL FOR THIS STEP?
Step 3a: Prioritize interventions.	Discuss with stakeholders to ensure potential interventions are acceptable and affordable.	What is the right intervention? • Addresses a locally important problem. • Evidence-based. • Cost-effective. • Feasible and sustainable. • Acceptable to community.	BABIES comparison to determine the "Opportunity Gap" to focus on what interventions might produce the most gain. Spider web and information on evidence-based interventions and internaitonal standard of care. Management countermeasure matrix to prioritize and assess feasibility. Management countermeasure matrix to identify strategies to implement interventions.
Step 3b: Implement interventions.	Involve stakeholders in collective action for implementation (resources, roles).	What is the right way to implement this? • **What are the goals and objectives?** • **What interventions will achieve our objectives?** • **Where?** Which sectors of the HCDS and in what geographic location? • **By whom?** • **When?** • **Cost?** • **How?** Cross-cutting strategies.	Cross-cutting strategies include: • creating partnerships; • empowering communities; • promoting healthy behavioral change; • building capable institutions; and • advocating for supportive policies.
Step 4 Monitor and evaluate. **Return to Step 1 to repeat the cycle.**	Promote participation in monitoring the program. Involve stakeholders in assessment of impact.	1. What do I need to know to assess if I am doing this right? 2. What do I need to know to see if my program did the right things right and had an impact? How is information used to monitor and evaluate newborn programs? The following questions should be asked and answered. 3. What indicators will be measured? 4. Which sources will provide the data? 5. How often will the data be collected? 6. Who will collect and analyze the data? 7. What is the anticipated response in the program when changes in the data are observed? 8. How can key stakeholders be involved? Evaluate outcome indicators at a certain date.	Select local indicators carefully. Plot data in BABIES over time. Basic data analysis skills. Epidemiology to assess impact.

"BRING IT ALL TOGETHER" SUMMARY OF TOOLS USED IN STEP-BY-STEP APPROACH

Parts Two and Three provided tools and a process to assist the program manager. This section summarizes how some of the tools can be sequenced to enhance the program manager's ability to better design, implement, and evaluate programs. These tools are outlined in Table 2.22. The following sequences will be demonstrated to clarify the process.

- **Using the BABIES matrix to fishbone diagram to identify problems and focus on the interventions.**
- **Using the health fishbone and countermeasure matrix to develop an action plan.**
- **Using the management fishbone and countermeasure matrix for monitoring and evaluating interventions.**

A. Using BABIES matrix to identify problems and focus on the interventions.

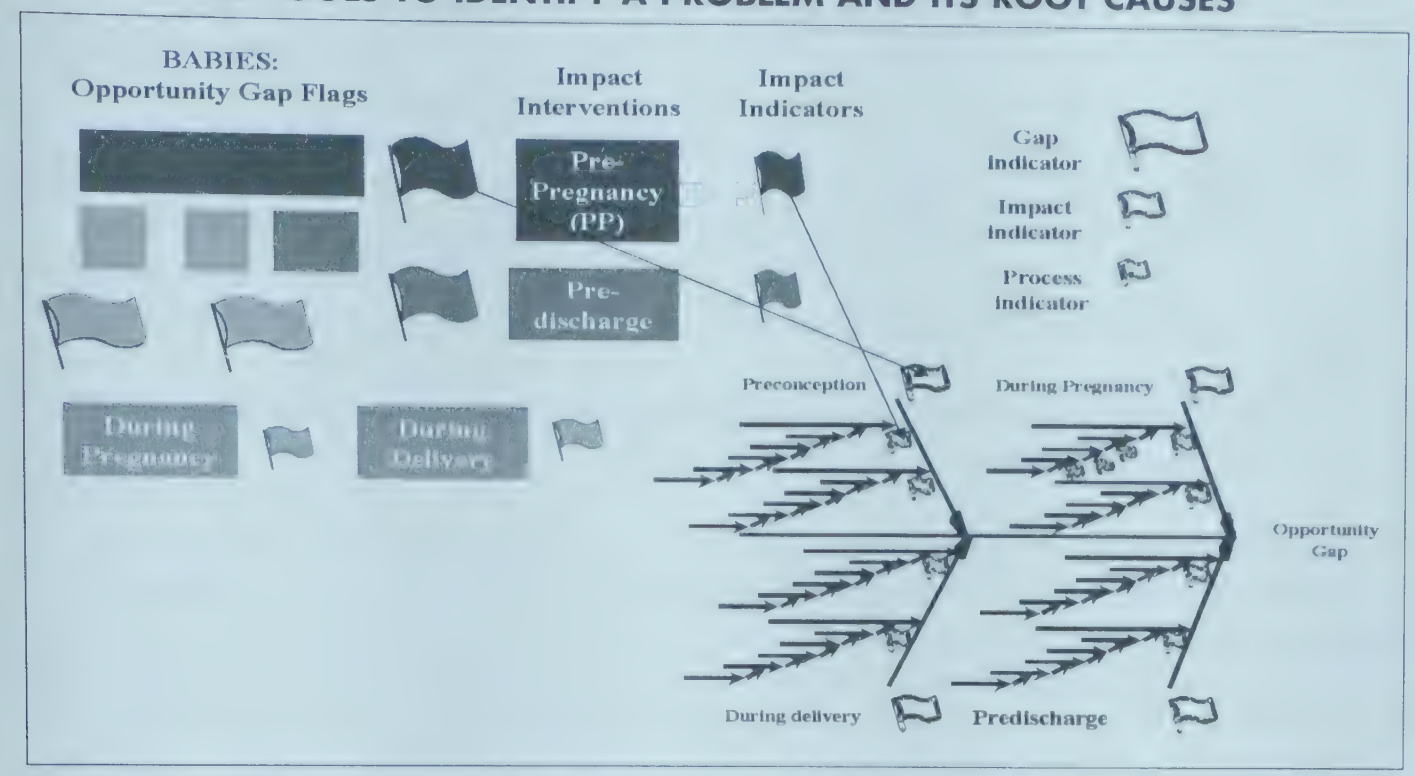
Every local HMIS system should strive to provide the most information with the least amount of data. The BABIES matrix does this by using two variables to calculate the various rates and ratios by changing the denominators of the 12 cells. These rates are made more functional by grouping the cells into the Intervention Packages and calculating the combined cells' rate. Once the combined cells' rates are available, they are compared to the selected standard population. The problem area ("Opportunity Gap") and relevent Intervention Package(s) can be identified. Describing BABIES in the simple epidemiological determinants of time, place, and person provides preliminary insight for formulating hypotheses to determine the cause of the "Opportunity Gap".

As described in Part Two, the fishbone diagram provides the progam manager with a tool to link the "Opportunity Gap" with its cause. Figure 3.9 provides a figurative example of the results that may be put forth from the BABIES matrix and placed into the fishbone diagram. There are four major problem categories and subsequent intervention time periods (i.e., pre-pregnancy care, care during pregnancy, care during delivery, newborn care). Program managers can start with facility-based data (health centers and hospitals) but should develop population-based surveillance as soon as possible.

The following symbols are used in Figure 3.9 to illustrate the transition from BABIES to the health fishbone:

- Large flags: the "Opportunity Gap;"
- Boxes: Intervention Packages;
- Fishbone: Each major line (bone) under a major category is an impact intervention;
- Midsize flag: Impact indicator;
- Small line: A potential "why" question that is asked to determine the cause; and
- Smallest flag: Represents a process indicator associated with a "why" for an intervention.

FIGURE 3.9
USING THE BABIES AND THE HEALTH FISHBONE AS TOOLS TO IDENTIFY A PROBLEM AND ITS ROOT CAUSES



For example, if the "Opportuntity Gap" is in the cells that indicate pre-pregancy health is the main problem, the Pre-pregancy Health Intervention Package would be appropriate. Presented below is an example of the process that might be carried out by the program manager to address pre-pregancy care.

- **Intervention Package:** Pre-pregnancy Care is identified in Step 1 of the Step-by-Step Approach as the priority problem. The "Opportunity Gap" from BABIES indicates that there is considerable potential for reducing the excessive mortality.

- **Package Component of Intervention Package:** Pre-pregnancy Intervention Package consists of family planning, maternal nurtition, avoidance of substance abuse, anticipatory guidance regarding birth planning, treatment of medical conditions not related to pregnancy (diabetes, hypertension), and prevention and treatment of STIs among women of reproductive age.

- **Key Intervention Strategy:** Based on Step 2 and using the fishbone diagram to assess local performance of the health care delivery system, family planning was found to require improvement. Interventions could be prioritized and designed to address weaknesses identified.

- **Select outcome indicator:** Based on the activities selected above, appropriate indicators (represented by the flags in Figure 3.9) can be developed. In this case, age at first pregnancy may be a relevant indicator.

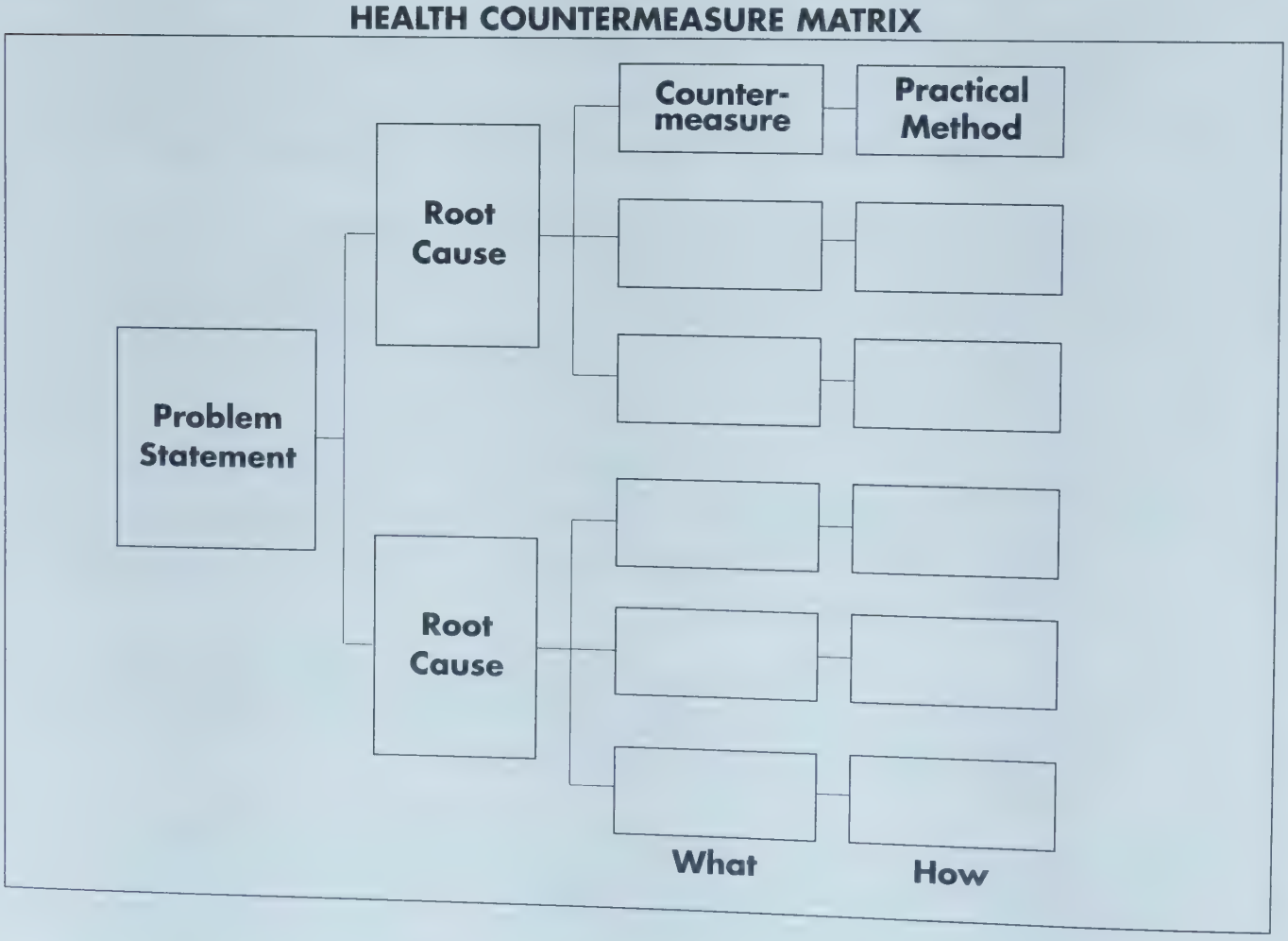
- **Select impact indicator:** A deviation from the expected or desired value of the indicator (flag) triggers an investigation as to "why" the indicator is not at the desired level. If a program manager was monitoring age at first pregnancy and it was not increasing, the program manager might begin asking questions about why not?

- **Process indicator:** In addtion, based on the activities selected appropriate indicators (represented by the flags in Figure 3.9) can be developed. A deviation from the expected or desired value of the indicator (flag) triggers an investigation as to "why" the indicator is not at the desired level. Five "why" questions are usually asked to determine a root cause. When a "why" statement is identified that can be acted upon, a cloud is drawn in the fishbone to indicate an "actionable" element. The actionable elements are seen as the "root cause" of the "Opportunity Gap." The smallest flags represent the process indicators that can fall into three categories — output, the 5 A's, or input. The actionable element is transferred to the countermeasure matrix as a "root cause" in the next figure.

B. Using the health fishbone and countermeasure matrix to develop an action plan.

The health countermeasure matrix (Figure 3.10) starts with the same problem statement in the health fishbone diagram (the "Opportunity Gap" indicator). The root causes, the actionable elements in the health fishbone, are placed in the appropriate box. For each root cause a countermeasure is identified (i.e., "what can be done" to counter the root cause). The practical method is "how" the countermeasure can be implemented. The program manager assesses the effectiveness and feasibility of each of the practical methods and chooses those most likely to be successful. The action plan is developed for each of the practical methods. For each of these activities, a process indicator can be identified. These are transferred to the management fishbone.

FIGURE 3.10
HEALTH COUNTERMEASURE MATRIX



C. Using the management fishbone and countermeasure matrix for monitoring and evaluating the interventions.

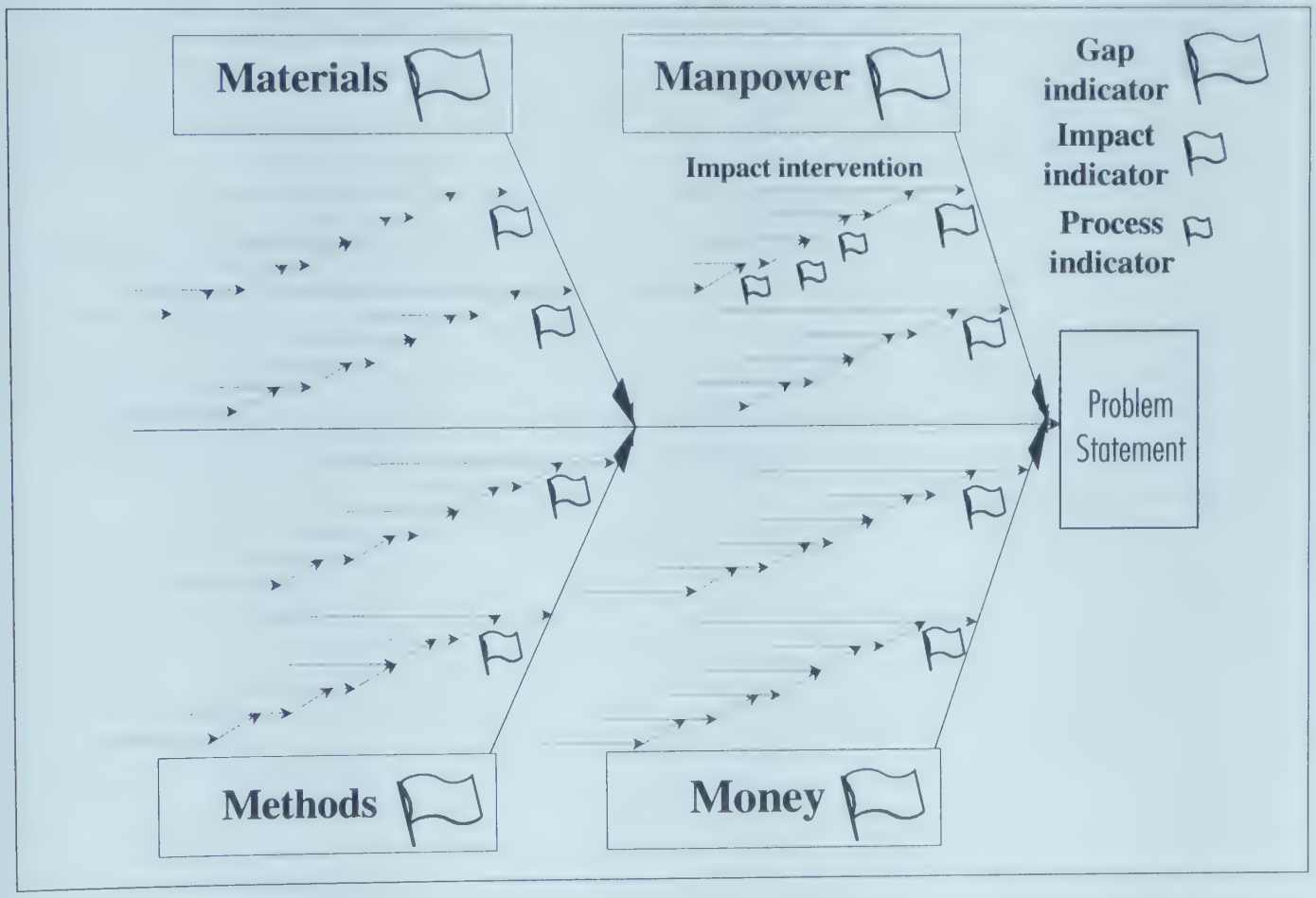
The program manager needs to know regularly the answer to two important questions to reduce the "Opportunity Gap."

Is the program doing things right? (Monitoring process)
Is the program doing the right things? (Evaluating outcome)

The adapted tri-level monitoring and evaluation procedure is used as described in Step 4, Part Three. In its simplest form, this procedure is an if-then logic model. **If** the program performs the right evidence-based activities in the right way, **then** there will be a positive effect on a health problem that should alleviate the health problem. This procedure assists the manager in identifying a management problem.

This management problem is placed at the head of the fishbone as the problem statement (Figure 3.11). The major categories are usually the materials, manpower, methods and money. Other categories, however, that might arise from a brainstorming session of the local quality team, may also be very appropriate for the local setting.

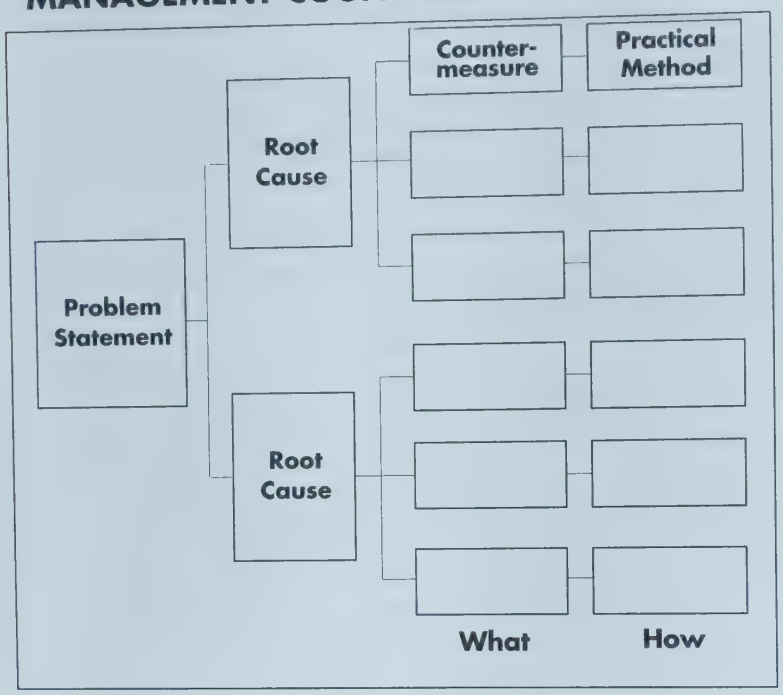
FIGURE 3.11
MANAGEMENT FISHBONE



The management fishbone provides the manager with the format to identify the appropriate indicators for the quality process. The performance of the process indicators is what triggers a local response to determine what is going wrong with the program. The data for these indicators are probably not collected on a routine basis. In the management fishbone, the time period is much shorter and hopefully the problem is quickly resolved. If the manager decides that the solution needs to be standardized, the indicator may be incorporated into the data routinely collected so the indicaor is constantly reviewed.

The management countermeasure matrix (Figure 3.12) starts with the same problem statement in the management fishbone. The root causes (the actionable elements in the fishbone) are placed in the approproate box. For each root cause a countermeasure is identified (i.e., "what can be done" to counter the root cause of the management problem). The practical method is "how" the countermeasure can be implemented. The manager assesses the effectiveness and feasibility of each of the practical methods and chooses those most likely to be successful.

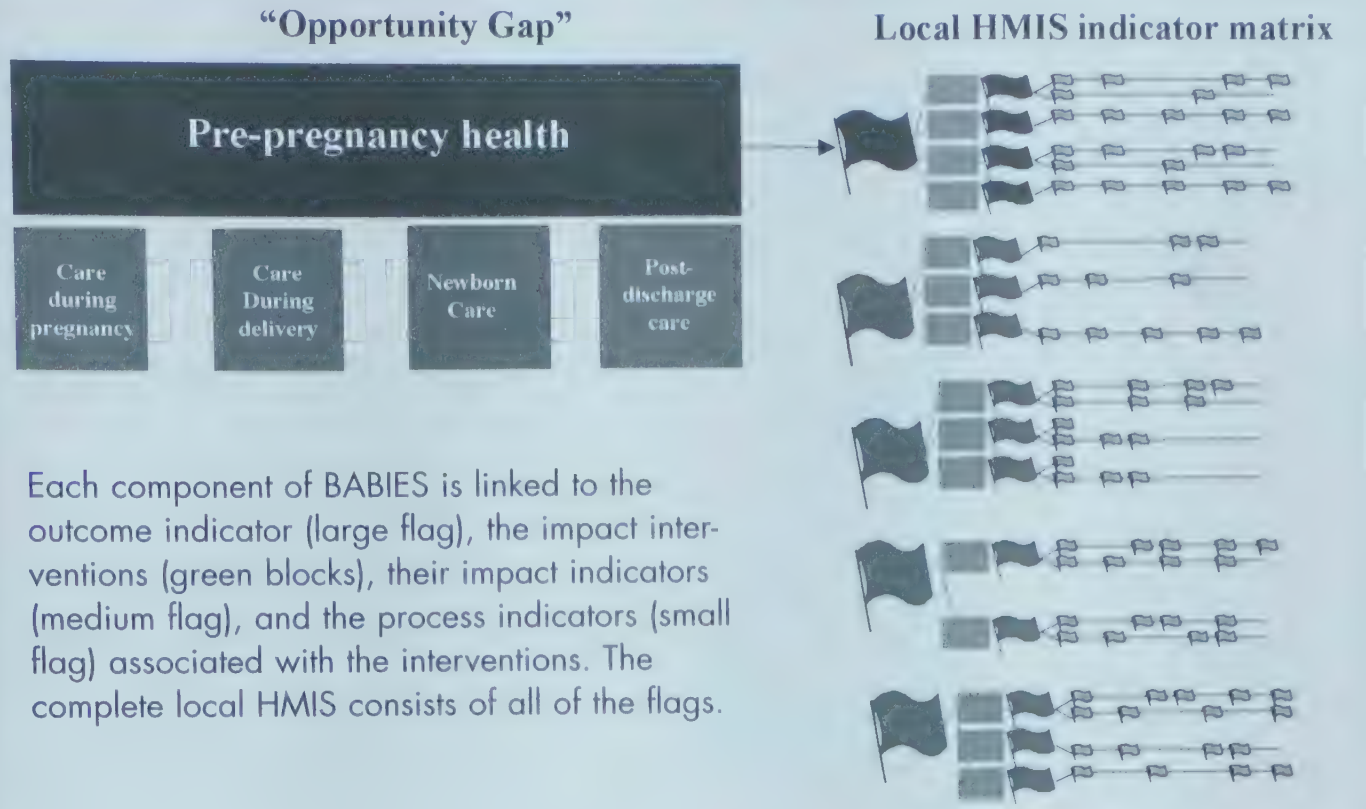
FIGURE 3.12
MANAGEMENT COUNTERMEASURE MATRIX



The cycle is completed by a review of BABIES. Each component is reviewed and the impact indicators assessed. The review results in a description of the remaining "Opportunity Gap" and an assessment of the performance of the health care system, and thus the cycle starts over again.

All of the indicators in the BABIES matrix and the fishbone diagram constitute the local HMIS indicator matrix. This flowchart (Figure 3.13) provides a visual representation of the local indicator system that is developed and supported by all the stakeholders. Not all the flags in the local HMIS matrix need to be filled with an indicator. The type and number of indicators will vary from one situation to another.

FIGURE 3.13
BABIES AND A COMPLETE LOCAL HMIS INDICATOR MATRIX



The BABIES matrix, the fishbone, the countermeasure matrix, and the action plan provide program managers with a structure that coincides very well with the step-by-step approach. In a given situation, each tool might be used in more than one step. Each tool lends itself to being the starting point of the next tool. The other quality tools described in Part Two, Section V supplement these four and serve to strengthen the capacity of the program manager to define a local HMIS that supports the development of quality services for the mother and newborn.

Part 4

Interventions for Newborn Health and Lessons Learned

PART FOUR

Interventions for Newborn Health and Lessons Learned

PAGE

Messages for Part Four 4.2

Terminology for Part Four 4.3

I. Principles of Newborn Health Interventions 4.4
- A. Interventions for the Mother *and* the Baby 4.4
- B. Systems Approach 4.4
- C. Acceptable Intervention Packages 4.6
- D. Prioritization in the Local Setting 4.6

II. Addressing the Delays in Receiving Quality Maternal and Newborn Care 4.8
- A. Delay One: Problem Recognition Within the Home 4.11
- B. Delay Two: Deciding to Seek Care 4.13
- C. Delay Three: Reaching the Health Facility 4.14
- D. Delay Four: Receiving Appropriate Quality Care at the Facility 4.17

III. Description of Intervention Packages and Package Components 4.18
- A. What is an Intervention Package? 4.18
- B. Using the Spider Web Framework to Design an Integrated System 4.19

IV. Intervention Packages by Time Period 4.21
- A. Pre-Pregnancy Health Intervention Package 4.21
- B. Care During Pregnancy Intervention Package 4.28
- C. Care During Delivery Intervention Package 4.47
- D. Postpartum Care of the Mother Intervention Package 4.56
- E. Newborn Care Intervention Package 4.57
  - E.1. Essential Newborn Care Intervention Sub-Package 4.58
  - E.2. Extra Newborn Care for the LBW Baby Intervention Sub-Package 4.80
  - E.3. Emergency Care for the Sick Newborn Intervention Sub-Package 4.92

Best Reading for Part Four 4.112

References 4.114



MESSAGES FOR PART FOUR

1. Understand the principles for newborn health interventions, particularly:
   - the importance of the rights of the mother and baby;
   - the need for a comprehensive health care delivery system;
   - the importance of information for newborn health programming.

2. Learn about approaches to reduce delays in accessing quality care for mother and baby.

3. Understand the "Spider Web Framework," a tool showing interventions by time period (pre-pregnancy, care during pregnancy, care during delivery, newborn care) for the mother and the baby. Interventions within each Intervention Package are listed as core services/package components (essential for all settings), additional (possible when capacity has been increased), and situational (appropriate for a given local problem, such as malaria or HIV). Core interventions should be the first priority in any setting.

4. Understand the need for Intervention Packages by time period and grasp the overall vision and aims of the following Intervention Packages:

   - Pre-pregnancy health.
   - Care during pregnancy.
   - Care during delivery.
   - Postpartum care of the mother.
   - Newborn care.
     - Essential newborn care.
     - Extra newborn care.
     - Emergency newborn care.

5. Learn more about the details of evidence-based interventions for priority problems within each of the intervention packages and how other programs have implemented such interventions.

TERMINOLOGY FOR PART FOUR

Birth planning: A process that empowers pregnant women, families, and communities to prepare for safe delivery and for motherhood.

Care during pregnancy: Care throughout pregnancy until the onset of labor, including care both at home and in the formal health care system, such as in an antenatal clinic.

Care during delivery: Care from the onset of labor until the delivery of the placenta.

Emergency newborn care: Identification, stabilization, and management of the sick babies with conditions such as neonatal sepsis, asphyxia, and jaundice.

Emergency preparedness: An approach to promote early recognition of complications for mother and baby at any time during pregnancy, delivery, or after delivery and to maximize the likelihood of timely referral and management. This involves preparedness in the community and in the formal health care system.

Essential newborn care: Basic preventive care for all newborns, especially warmth, cleanliness, breastfeeding, cord and eye care, and immunizations.

Extra newborn care: Identification of and additional support for babies who are born weighing less than 2,500 grams. Mortality rates for babies with birth weight between 1,750-2,500 grams can be improved significantly with simple interventions. Babies weighing less than 1,750 grams at birth are likely to require more specialized care. May also apply to other babies who are not LBW, but have other special requirements, such as babies born to HIV-positive mothers.

Intervention package: A group of interventions that are individually of proven effectiveness in reducing fetal-neonatal mortality and are combined as they apply to the same period (i.e., care during pregnancy) or the same problem (i.e., neonatal tetanus). The intervention package is not just for the formal health sector but for all levels of care.

Newborn (or neonatal) care: Care from birth until the 28th completed day of life, including care both at home and in the formal health care system.

Intervention package component: A group of services within an Intervention Package.

Partograph: A written record charting the progress of labor and delivery and showing the key observations to monitor the women and the fetus, such as pulse, blood pressure, fetal heart rate, etc.

Postpartum care: Care from delivery until 42 days after delivery, including care both at home and in the formal health care system.

Pre-pregnancy health: The health of the woman before she becomes pregnant.

Skilled attendant at birth: An individual with midwifery skills (i.e., doctors, midwives, nurses) who has been trained to proficiency in the skills to manage normal deliveries and to diagnose and manage or refer complicated cases.

Spider Web Framework (Figure 4.4): A tool showing interventions by time period (pre-pregnancy, during pregnancy, during delivery, newborn care) for the mother and the baby. Package components within each Intervention Package are termed:

- core (essential for all settings);
- additional (possible when capacity has been increased); and
- situational (appropriate for a specific local problem, such as malaria or HIV).

I. PRINCIPLES OF NEWBORN HEALTH INTERVENTIONS

PRINCIPLES OF NEWBORN HEALTH INTERVENTIONS

- **PRINCIPLE 1**
  Interventions for the mother *and* baby.
- **PRINCIPLE 2**
  A systems approach to strengthen the health care delivery system.
- **PRINCIPLE 3**
  Using information to adapt intervention packages.
- **PRINCIPLE 4**
  Using information to prioritize management process in the local setting.

A. Interventions for the Mother *and* the Baby

Most of the world's neonatal deaths occur in poor rural homes and can be prevented by very simple, low-technology interventions, often at low cost.

The main factor that has been missing is attention to the newborn with the mother at all levels of decision-making. Because all fetal deaths and most neonatal deaths are related to maternal causes, priority should be given to interventions that benefit both the mother and baby. Some evidence-based interventions benefiting both are outlined in Table 4.1

B. Systems Approach

Since the majority of deaths occur in the community, there is a need for a systems-based approach that involves the community and targets the particular populations where the most deaths occur. Successful reduction of fetal-neonatal mortality is most likely if the program manager and other partners work to strengthen the existing health care delivery system (HCDS) with input from all of the key stakeholders. This involves strengthening the capacity of the current system by improving quality as well as increasing access. A strong system aims to provide core interventions at all levels for the mother and the baby. These interventions can be grouped together as Intervention Packages[1].

TABLE 4.1
INTERVENTIONS THAT BENEFIT BOTH MOTHER AND NEWBORN

BENEFIT TO MOTHER	INTERVENTION	BENEFIT TO NEWBORN
During pregnancy	**During pregnancy**	**During pregnancy**
Reduced risks of infection, pelvic inflammatory disease (PID), infertility, other STI complications.	← Treatment of STIs (especially syphilis). →	Reduced stillbirth, preterm birth, IUGR, ophthalmitis, infection, death.
Decrease severe anemia, severe malaria, death.	← Prevention/treatment of malaria. →	Reduced risks of stillbirth, preterm birth, IUGR, death.
Reduced risk of tetanus (rare).	← Administration of tetanus toxoid vaccine. →	Protect against neonatal tetanus (common).
Decrease iron deficiency anemia.	← Provide iron and folic acid; treat hookworm. →	Reduced risk of LBW, asphyxia, stillbirth.
Reduce "depletion syndrome."	← Targeted protein-calorie supplements. →	Reduced risks of LBW, preterm birth, perinatal death.
Possible reduction in maternal mortality.	← Provide Vitamin A (if deficient). →	Reduced neonatal and postneonatal infections.
Reduced risk of eclampsia and adverse outcomes, including death.	← Identification and management of pregnancy → induced hypertension pre-eclampsia.	Reduced risk of LBW, asphyxia, stillbirth, neonatal death.
Decrease prolonged labor, ruptured uterus, death.	← Identification of major risk of obstructed → labor (dystocia).	Reduced risk of asphyxia, fetal-neonatal death, birth trauma.
During delivery	**During delivery**	**During delivery**
Early identification and management of complications and reduced death and morbidity.	← Delivery with skilled attendant/partograph → and access to emergency obstetric care.	Reduced neonatal asphyxia; provision of neonatal resuscitation if needed.
Reduced risk of infection, sepsis, infertility.	← Clean delivery. →	Reduced risks of tetanus, sepsis, deaths.
Reduced risk of infection, sepsis, infertility.	← Antibiotics for prolonged/preterm → rupture of membranes.	Reduced risk of sepsis and death.
No known benefit.	← Corticosteroids in preterm labor. →	40% – 60% reduced risk of respiratory distress.
Immediate postpartum period	**Immediate postpartum period**	**Immediate neonatal period**
Reduced risk of death (40% of maternal deaths occur within first week after delivery).	← Integrated maternal and newborn → postpartum care.	Reduced risk of death (66% of neonatal deaths occur within the first week after birth).
Reduced risk of postpartum hemorrhage, breast abscess.	← Promotion of early breastfeeding. →	Prevent early hypoglycemia, dehydration; reduced risks of early neonatal jaundice and sepsis/ALRI.
Reduced maternal stress due to infant illness.	← Appropriate cord, eye, and skin care. →	Reduced risks of sepsis, tetanus, ophthalmitis.
Enhanced bonding.	← Promote skin-to-skin contact. →	Enhanced thermal regulation.
Reduced Vitamin A deficiency, night blindness.	← High-dose Vitamin A to mother. →	Possible reduction in neonatal infection.
Reduced maternal depletion, especially if pregnancy and breastfeeding overlap.	← Family planning counseling. →	Reduced risk of early malnutrition if mother stops breastfeeding after she becomes pregnant again.

C. Adaptable Intervention Packages

Intervention Packages consist of a group of individually effective activities/services (called Package Components) in reducing fetal-neonatal mortality. These activities/services are combined when they apply to the same period (i.e., care during pregnancy). The Intervention Package helps to integrate a variety of activities to develop a systematic approach that will have an impact on fetal-neonatal mortality. Each Intervention Package includes activities/services that can be applied at all levels of the HCDS (i.e., the community, formal health care sector, and intersectoral sector). The following Intervention Packages will be covered in this part.

- Pre-pregnancy health.
- Care during pregnancy.
- Care during delivery.
- Postpartum care of the mother.
- Newborn care.
  - Essential newborn care.
  - Extra newborn care.
  - Emergency newborn care.

The Intervention Packages are intended to be adapted to the needs of the local setting. This may involve the prioritization of a particular intervention package or a specific package component. Although one Intervention Package may be the first priority in the local setting, the greatest effect on newborn and maternal survival will come when all of the core activities/services are functioning well as a system. The single most important intervention is a skilled attendant at delivery who serves to reduce neonatal asphyxia, sepsis, and tetanus (Table 4.1). This is also likely to be the single most important intervention for the reduction of maternal deaths, as reflected in the major WHO initiative "Making Pregnancy Safer"[2]. Other evidence-based interventions are outlined in Table 4.1.

D. Prioritization in the Local Setting

There is no one-size-fits-all newborn health program. Evidence-based Intervention Packages and lessons learned from field-based programs need to be adapted to fit the local setting. The causes of fetal-neonatal deaths are a complex mix of medical and social factors that vary by setting, as detailed in Part One. Local newborn health problems need to be examined and prioritized on the basis of data and community perceptions, as detailed in Part Three.

Step 1: Define the problem. This step enables the program manager to develop a consensus with key stakeholders about the priority problems for newborn health in the local setting, according to the analyzed data and the priorities of the community. Assessment tools, such as the BABIES matrix detailed in Part Two, can be used to maximize the information from the limited data available.

Step 2: Assess performance. Assessing the current and potential performance of the entire HCDS to implement certain core services is a critical step to developing newborn health interventions. The interventions that will be successful in a given setting are clearly influenced by the level of development, the infrastructure, and the HCDS. Approaches to assess performance are outlined in Part Three, Step 2.

Step 3a: Prioritize interventions. If the core services for the identified problem are not in place or if coverage of these services is very low, the program manager knows that the priority is to provide the appropriate core services. The activities/services selected should be the ones that will have the greatest impact on newborn survival in the local setting. If the core services are in place, the program manager has to prioritize which Intervention Packages and/or Package Components would most likely make a difference in the local setting and focus on improving quality of care.

Step 3b: Implement interventions. Regardless of the chosen interventions, certain cross-cutting strategies are needed to implement them. These cross-cutting strategies include:

- creating partnerships;
- empowering communities;
- promoting healthy behaviors;
- building capable institutions; and
- advocating for supportive policies.

Step 4: Monitor and evaluate. Monitoring serves to provide information for decision-making in a program. Evaluation determines whether the interventions had the intended effect (and if not, why not).

Part Four covers the importance of addressing delays in accessing quality care for the mother and newborn. Part Four also outlines potential approaches to reduce delays.

II. ADDRESSING THE DELAYS IN RECEIVING QUALITY MATERNAL AND NEWBORN CARE

Improving access to quality health services for both the mother and the newborn is a central theme to improving both maternal and fetal-neonatal outcomes. Delays in access to care can occur at any point throughout pregnancy, delivery, or postpartum/newborn periods. These delays may have fatal consequences for the fetus, baby, and/or mother. Access to health care is determined by more than the distance to the nearest health facility as discussed in Part One. Factors that influence care-seeking behavior include the ability of community members to recognize illness, traditional beliefs, availability of transport, the acceptability and affordability of formal health care services, and the hours that the health facility is open.

There are four key barriers, presented below, that contribute to maternal and newborn deaths.

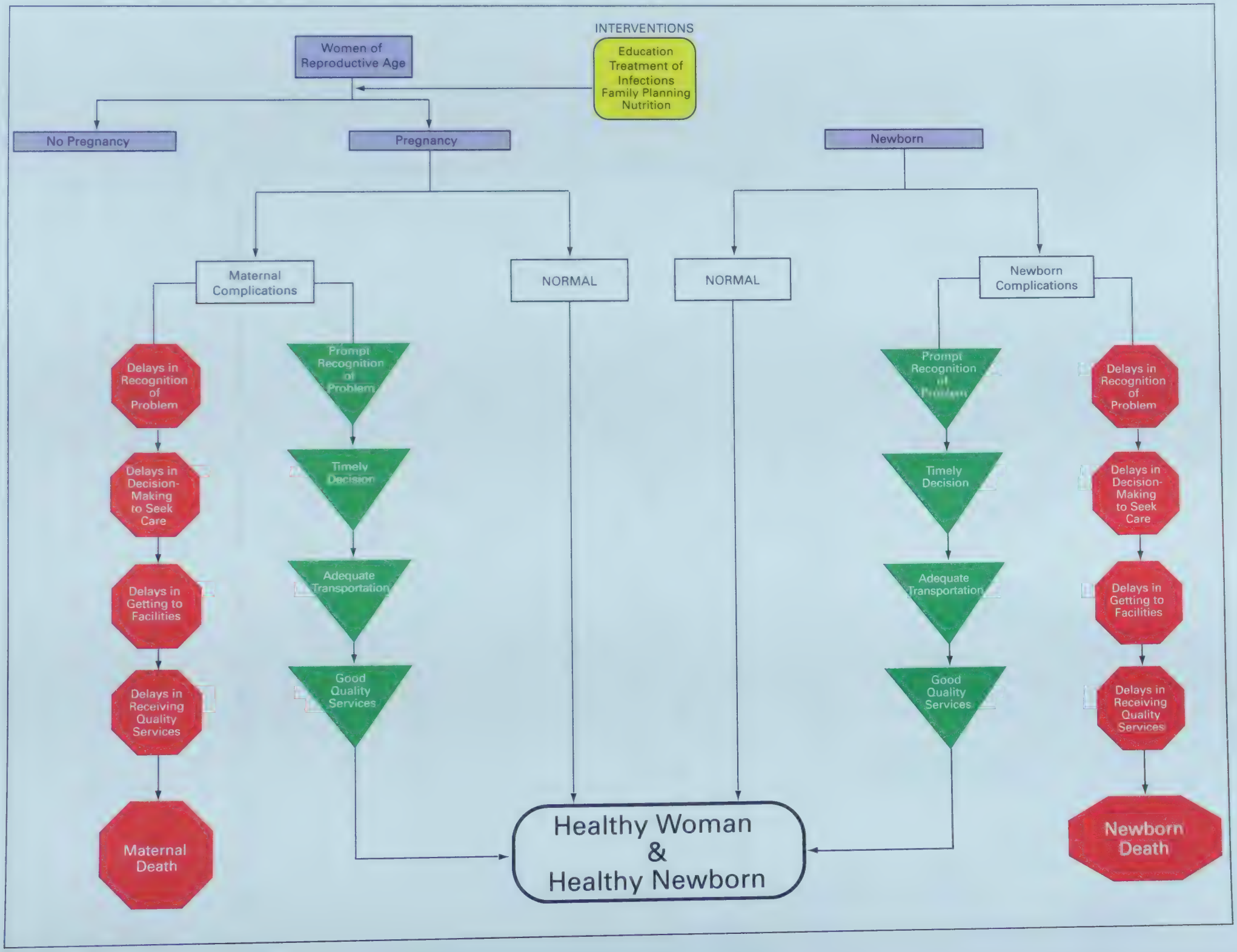
- ➔ ***Delay #1: Delays in problem recognition within the home;***
- ➔ ***Delay #2: Delays in deciding to seek care;***
- ➔ ***Delay #3: Delays in reaching the health facility due to lack of transport and resources; and***
- ➔ ***Delay #4: Delays in receiving appropriate quality care at the facility.***

The first three delays demand action at the household and community level. Addressing the fourth delay, by supplying excellent services at the health care institution level, will have little impact on outcomes if danger signs are unrecognized or mothers choose not to use these services.

To improve maternal and newborn outcomes, it is necessary to address all of these key delays. Improving capacity for emergency obstetric care (EmOC) in the facility (delay four) is unlikely to be effective if there is no community demand for services. There is also an ethical question, *Is it right to educate the community to recognize danger signs, improve decision-making and transportation if the health facility cannot treat the emergencies when they arrive?* To reduce delays, cooperation between the formal, informal, and intersectoral sectors is necessary. It is particularly important that the formal health sector adopt a listening attitude to facilitate dialogue with all stakeholders. (see Community Empowerment Step 3b, Part Three).

Figure 4.1 outlines how the delays contribute to maternal and/or neonatal deaths.

FIGURE 4. 1
PATHWAY TO HEALTHY MATERNAL AND NEWBORN CARE



Source: Ross, S.R.[4].

One practical way to foster change at the local level is to involve all the sectors of the HCDS in discussions of the death of a mother or newborn. An investigation could be done at each level of the HCDS to help the program manager and stakeholders understand the main factors contributing to these deaths. This approach has been used successfully in the Safe Motherhood program in Malawi (Panel 4.1). Sometimes solutions address only emergencies for the mother but do not include the management of the newborn; both should be considered at the same time.

PANEL 4.1
LESSONS LEARNED

USING ONE DEATH TO PREVENT OTHERS IN A COMMUNITY IN MALAWI

A woman died from infection after emergency obstetric surgery in a hospital. After the initial period of mourning, a village meeting was called to discuss what could be done to prevent this from happening again. A local band used music, songs, and drama to facilitate the discussion. Analyzing this death led to several improvements:

- New sterilizing equipment.
- Re-equipping the hospital with new bed sheets and plastic bed covers.
- Resources to buy a refrigerator to store blood.
- Retraining in operative technique for several staff members.
- Antibiotic supplies in health centers so they could treat women before referring them.

Source: Strengthening safe motherhood[3].

A. Delay One: Problem Recognition Within the Home

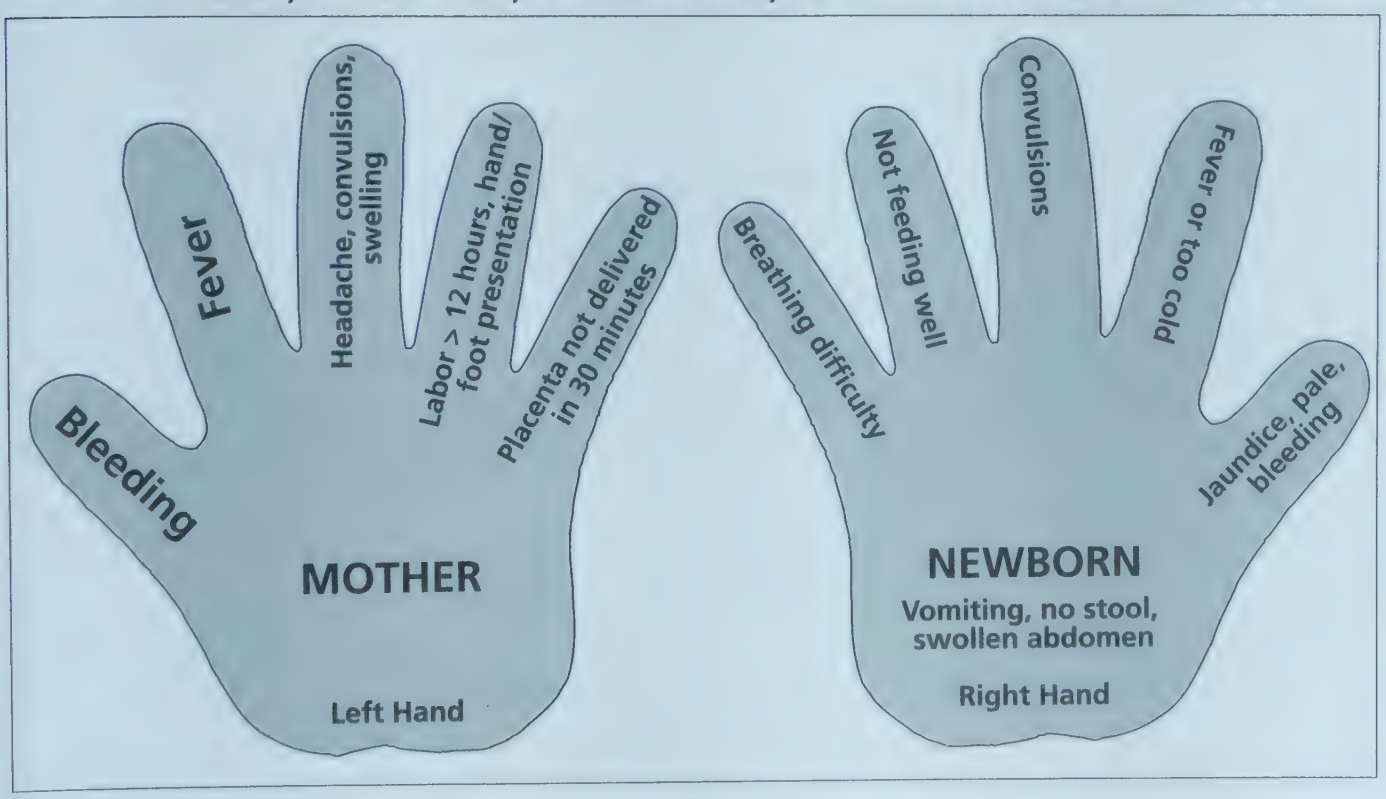
KEYS TO ADDRESSING DELAY #1

- ➡ **UNDERSTANDING DANGER SIGNS.**
  - In pregnancy
  - In labor/postpartum
  - For the newborn
- ➡ **BIRTH PLANNING FOR INDIVIDUALS, HOUSEHOLDS, AND COMMUNITIES.**

In many settings with high rates of maternal and fetal-neonatal mortality, communities and health personnel lack both the ability and knowledge to recognize critical danger signs. In addition, they may not fully comprehend the urgency of treating complications affecting the mother and/or newborn. As more deliveries occur with skilled birth attendants who are trained in the recognition of danger signs, this delay should become less common. However, it is still crucial for mothers to know danger signs for themselves and their babies. Education in an antenatal clinic cannot be effective alone since it is only directed at women who attend ANC services. Unfortunately, this information does not reach women who do not attend ANC visits, men and other key decision-makers, such as mothers-in-law, husbands, or village elders.

The key to improving the recognition of danger signs is to incorporate behavioral change approaches into field programs. Birth planning is an educational process to enable women and their families to prepare for a complication, should it arise. This process may assist women and their families in adopting and maintaining healthy behaviors. The birth planning approach is directed at pregnant women, their families, and key community key decision-makers. The content of the birth planning messages must be simple and memorable. The information needs to be presented through a media that is easily understandable, such as songs, dramas, or puppet shows. In Guatemala, the concept of "a handful of danger signs" was used to impart this information. As presented in Figure 4.2, the left hand describes the danger signs for the mother and the right hand describes the newborn danger signs (Figure 4.2 and Panel 4.2).

FIGURE 4.2
DANGER SIGNS FOR THE MOTHER AND THE NEWBORN THROUGHOUT PREGNANCY, CHILDBIRTH, POSTPARTUM, AND THE NEWBORN PERIODS.



PANEL 4.2
LESSONS LEARNED

A HANDFUL OF NEWBORN DANGER SIGNS IN GUATEMALA

Fetal-neonatal mortality is a serious problem in Guatemala. This is especially true in rural areas where most deliveries happen at home with assistance from TBAs. Perinatal causes are the single largest cause of infant deaths. In this region, about 40 percent of fetal-neonatal deaths occur during delivery or the first 24 hours and are due to asphyxia. The other main causes of neonatal deaths are neonatal sepsis and preterm birth caused 20 percent of neonatal deaths.

A study found that delay in recognition of the severity of illness was an important factor in increasing the risk of death. The field workers were taught danger signs for the newborn, with the five fingers of the hand used as a memory aid (Figure 4.2). Babies identified as having severe illness were treated with antibiotics and taken to the hospital, although a few families refused hospital care. Most of these babies (86%) survived despite potentially life-threatening illnesses. This survival rate was much higher than previously recorded in the area and was attributed to earlier recognition of illness. Preterm babies had an 11-fold greater risk of having a life-threatening illness. Full-term LBW babies had a three-fold greater risk. Thus, early recognition of illness saves lives, especially those of small babies.

Source: Bartlett et al.[5], Schieber et al[6].

B. Delay Two: Deciding to Seek Care

KEYS TO ADDRESSING DELAY #2

- ACTION PLAN FOR EMERGENCIES TO SEEK CARE IN A TIMELY MANNER.
- PROXY DECISION-MAKERS IF NECESSARY.

Many factors influence the household decision-making process. Decision-making may be mainly the role of the husband and male village leaders. In some countries, the sex of the baby also affects the decision-making processes, girls being less likely to have access to formal health care. Reaching a decision to travel and to spend money on formal care may be a slow process.

The key to reducing the delay in deciding to seek care is to develop an action plan before an emergency occurs. At the household level, the pregnant woman, her husband, and other decision-makers, such as the mother-in-law, decide on a plan of action, if the mother or the baby develops a complication. This plan should be made during pregnancy, not after a complication occurs. With a plan in place, if a problem does occur during labor, hours or even days may be saved, especially if the husband is out of town. The community also has a key role to play in decision-making that influences when and/or if the woman seeks emergency obstetric care.

One barrier to planning ahead in traditional societies is the fear that merely discussing the possibility of adverse outcomes may increase their occurrence or result in a curse on the family. Knowledge of the local culture is essential to overcome this barrier, as shown in the example of the green pendelu as described in Panel 3.2. The community also has a role to play in the decision-making process.

The community may appoint proxy decision-makers to take responsibility for making decisions about a pregnant woman and her newborn's health if the husband/father or village elder is absent. Mothers and their families may not know where to go for care, and this confusion may lead to delay. In a study conducted in a peri-urban slum in India, researchers found that mothers had knowledge about danger signs but were unclear about where to seek appropriate care[8].

In some communities, traveling to a formal health care institution may not be feasible or may be unacceptable. Provision of care in the community may be a solution for some communities, particularly for certain emergencies, such as neonatal sepsis, as shown by SEARCH in rural India[9]. However, community-level treatment may not be feasible for all emergencies, especially obstetric emergencies, such as antepartum hemorrhage. The decision to provide community-based emergency care will depend on the prevalence of local health problems, the capacity of local institutions, and the capacity of the community to provide quality emergency care.

C. Delay Three: Reaching the Health Facility

KEYS TO ADDRESSING DELAY #3

- ➡ COMMUNITY MOBILIZATION FOR EMERGENCY TRANSPORT.
- ➡ COMMUNITY EMERGENCY FUND.

Once the decision has been made that the mother or the newborn should seek emergency care, availability and cost of transport are common barriers. The key to overcoming this problem, especially in isolated communities with few resources, is community participation.

At the community level, awareness of the problem of transportation can stimulate discussion, especially if a women or newborn in the community has died. A community that has discussed and recognized underlying reasons for delays in transportation can often prevent these delays. These underlying reasons may seem obvious, for example no roads or very few vehicles, but community members may identify less obvious reasons, such as attitudes of transport workers, security, or landmines. A specific community plan for transport emergencies can be helpful, even in remote areas (Panel 4.3).

If a sick mother or newborn is referred from one level of the health care system to the next level (i.e., health center to hospital), the chance of survival is greater when the referring health provider attempts to stabilize the condition and arranges for transport. For example, a baby who is feeding poorly and has a fever should be given a dose of antibiotics before transfer,. The mother should be supported to express milk and cup feed to reduce the risk of hypoglycemia. A simple referral letter also improves treatment at the next level of care, especially if the letter describes the drugs and doses given by the referring health center. Stabilization and safer referral of emergencies require that local health care workers be trained in basic obstetric and newborn first aid.

If timely and safe transportation, especially for emergencies during delivery, is not feasible, an alternative is a maternity waiting home. A waiting home is a place for the pregnant woman to stay near a facility with emergency obstetric services. Women who are known to have a high chance of requiring emergency services, particularly those with previous cesarean section, intrapartum fetal death, or multiple pregnancy, will benefit the most. Maternity waiting homes are more effective when community members are involved in building and managing them. For example, a study in Zimbabwe of 6,438 women delivering at a district hospital found that women staying in a free self-catering maternity waiting home had a 50 percent reduction in late fetal and early neonatal deaths compared to women coming from home, even after correcting for potential confounding factors[13]. Panel 4.3 describes a successful transportation program in Tanzania.

PANEL 4.3
LESSONS LEARNED

PEDALING FOR OBSTETRIC EMERGENCIES IN TANZANIA

Maternal mortality in rural Tanzania is high, estimated at up to 700 maternal deaths per 100,000 live births. About half of deliveries take place at home, and 22 percent of women receive no assistance at delivery. A major problem in the Lake Region is access to emergency obstetric care because there are few vehicles and bridges, and roads are often impassible.

A collaborative effort between the Tanzanian Ministry of Health, CARE, and USAID has been developing community-based reproductive health services. Delays in transportation were identified as a key problem. A team from CDC (CCHI) assisted in developing a participatory approach that enabled each village to adopt a community plan for accessing emergency obstetric care. It involved raising awareness of maternal health, showing pictures of transportation systems that had worked elsewhere, and meeting with the community and leaders to gain a consensus. A village committee was identified to support the village health workers and oversee emergency transport. Alternatives for emergency transport systems included a tricycle with a stretcher attached for the woman to lie on, a boat, or a savings fund to pay for hire of a vehicle.

At follow-up 6 months later, 52 of 62 villages had an action plan in place. Those communities with a recent maternal death in the village were the most successful in mobilizing resources. Those very far from the hospital were more likely to have a functioning emergency transport.



Source: Ahluwalia I et al.[11], Kouletio et al[12].

Community loan programs: In many countries, people may not have access to funds to pay for transportation and/or health services or supplies. Developing a community loan fund to address this problem has been successful in many settings (Panel 4.4).

PANEL 4.4
LESSONS LEARNED

COMMUNITY SAVING FUNDS FOR MEDICAL EMERGENCIES IN NIGERIA

Maternal mortality in rural northern Nigeria is very high. One of the identified problems was lack of funds to pay for transportation for emergency obstetric care. A hospital in Ekpoma was active in mobilizing the surrounding communities to set up emergency transportation funding schemes. Of the 13 clans to which funding scheme proposals were presented, 12 launched loan funds. In the first year, 456 families requested loans ranging from the equivalent of US $7 to US $15. Three hundred eighty loans were granted. Three hundred fifty-four were repaid in full.

Although the number of women admitted to the hospital remained constant, the number of cesarean sections performed in the hospital increased from 0 in 1991 to 13 in 1995. The number of women with complications seen at the hospital increased from 7 in 1990 to 29 in 1995. During the same period, the Prevention of Maternal Mortality project enabled this hospital to establish a revolving drug fund, conduct staff development training in obstetric services, and receive equipment for an operating theater, labor suite, and laboratory. Unfortunately, subsequent riots in the region and the national introduction of user fees affected sustainability.

Source: Chiwuzie et al[10].

D. Delay 4: Receiving Appropriate Quality Care at the Facility

KEYS TO ADDRESSING DELAY #4

- ➡ **STANDARD PROTOCOLS FOR EMERGENCIES.**
- ➡ **SYSTEM OF TRIAGE.**
- ➡ **SKILLED COMPETENT STAFF.**
- ➡ **CLIENT-CENTERED CARE.**

A study in Mexico City found that approximately 80 percent of maternal deaths were related to a delay in receiving care within the institution (i.e., medical error[14]. Thus, the quality of care is determined by many factors, but it is primarily determined by the skill and motivation of personnel. In settings where pay and morale are low and frustrations are high, it is difficult to attract and motivate good personnel. Quality care can be improved by instituting standards of care by:

- instituting or strengthening standards of care;
- training staff on interpersonal skills, as well as clinical skills, particularly the saving skills, neonatal resuscitation and management of the sick newborn;
- enhancing supportive supervision; and
- ensuring that services are available 24 hours a day with adequate equipment.

Program managers should emphasize life-saving skills to resuscitate and stabilize sick neonates as well as care for the mother. Interventions also should be available 24 hours a day to have significant impact. Equipment and supplies need to be consistently available. The time elapsed before an emergency case received appropriate attention and treatment in the health institution is a major indicator of the quality of a service and should be monitored. The general principles of improving quality of care are covered in Part Two. The CD-ROM includes details about quality improvement.

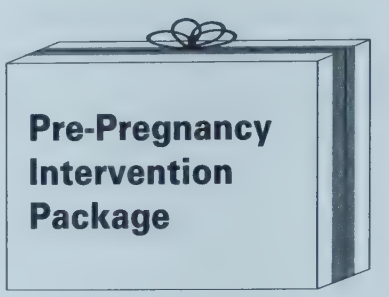
III. DESCRIPTION OF INTERVENTION PACKAGES AND PACKAGE COMPONENTS

A. What is an Intervention Package?

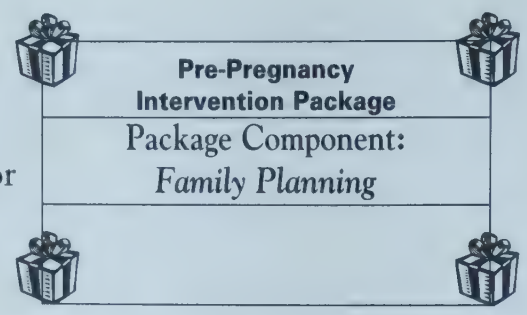
An intervention package is a group of activities/services that individually have been effective in reducing fetal-neonatal mortality. They are combined when they apply to the same time period, during pregnancy. The Intervention Package is for all sectors of the HCDS, not just for the formal health sector. There are five Intervention Packages, arranged by period of care that will be discussed.

- Pre-pregnancy Health Intervention Package.
- Care During Pregnancy Intervention Package.
- Care During Delivery Intervention Package.
- Postpartum Care of the Mother Intervention Package.
- Newborn Care Intervention Package.
  - Essential Newborn Care Intervention Sub-Package.
  - Extra Newborn Care Intervention Sub-Package.
  - Emergency Newborn Care Intervention Sub-Package.

Each Intervention Package relates to all the sectors of the HCDS. The Intervention Package has an overall vision (long-term goal) and a list of aims related to the key package components (core activities/services). Each of the five Intervention Packages are represented in a box presented to the right.



The package components, within each Intervention Package, are discussed in more detail after the introduction to the Intervention Package. Many of the package components will have specific boxes outlining key informaiton about the service/activity that is important for program managers to understand, presented in a box presented to the right. There are also several lessons learned panels, successful field programs that have effectively implemented the activities/services. Strategies for implementing cross-cutting approaches, such as community empowerment, behavioral change and capacity building are discussed in Part Three, again with more detailed resources provided on the CD-ROM. This manual is not designed to cover all the details of the activities/services; rather, it is intended to guide the program manager in making decisions. Detailed clinical guidelines are included in WHO references, such as "Managing Complications in Pregnancy and Childbirth (MCPC)" and other relevant documents on the CD-ROM. Many of the maternal Intervention Packages are covered in "Promoting Quality Maternal and Newborn Care: A Reference Manual for Program Managers," which is also on the CD-ROM.



B. Using the Spider Web Framework to Design an Integrated System

Each of the Intervention Packages, if well implemented, can contribute to a reduction in fetal-neonatal deaths. However, to have the maximum improvement in newborn survival and health, the core activities/services for all the Intervention Packages need to be in place and functioning. While no program manager is able to incorporate all of the Intervention Packages immediately, the goal is to prioritize those most important to implement first and then gradually integrate all of the Intervention Packages.

The Spider Web Framework, presented in Figure 4.3, is a tool to help visualize the interrelationships between the five Intervention Packages. The Intervention Packages are divided into three categories, presented below.

First Level (center of the Spider Web) core activities/services: These are the essential services for each time period that apply to any setting, even those with very little infrastructure.

Second Level (middle of the Spider Web) additional activities/services: These services become feasible as capacity is strengthened.

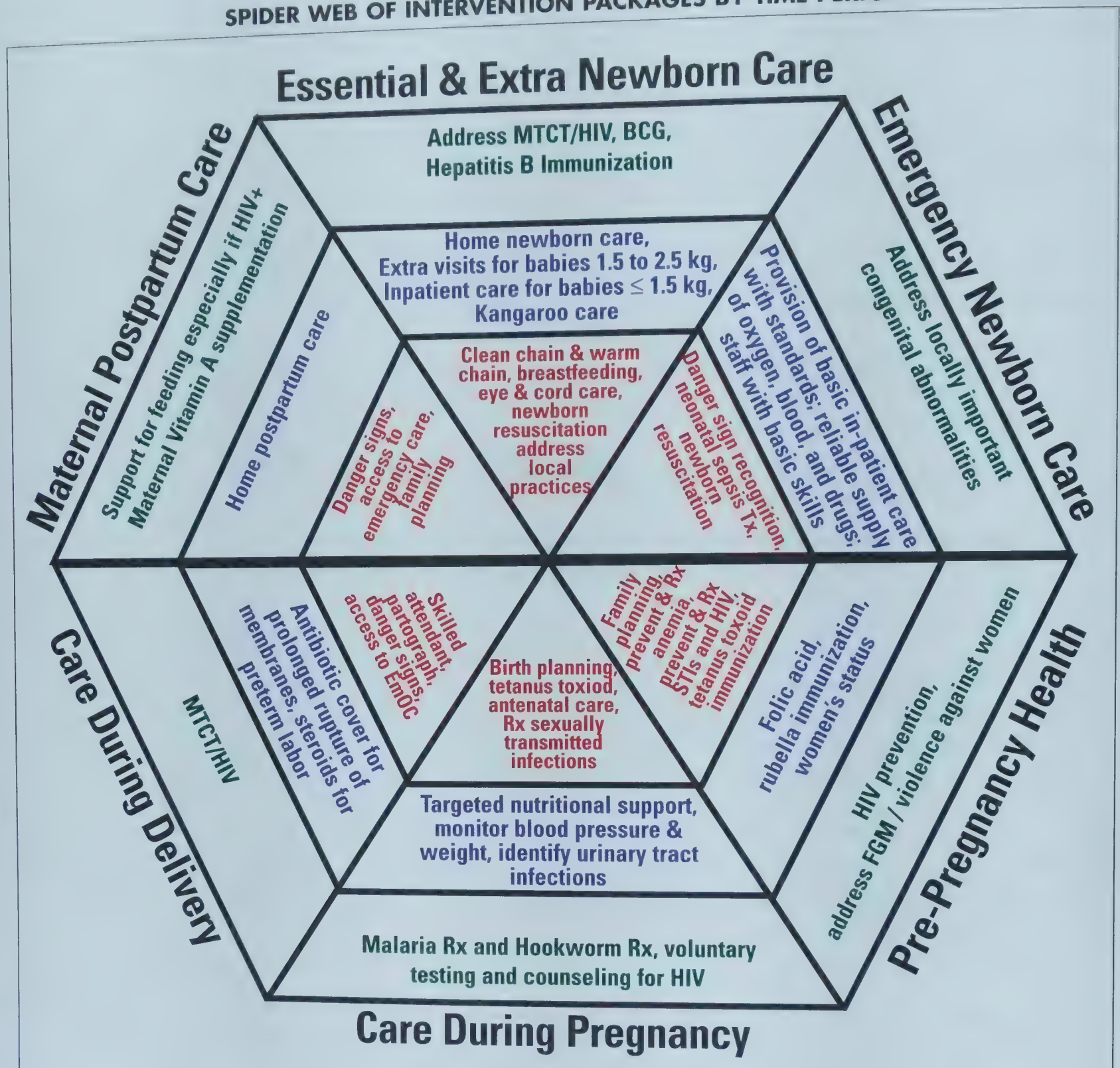
Third Level (outer level of the Spider Web) situational activities/services: These services are relevant to a particular situation, such as where malaria, HIV, or some other specific problem is common.

Grouping activities/services into core, additional, and situational categories is somewhat arbitrary. A specific local problem may lead the program manager and community to prioritize a particular intervention that has been listed here as additional. The step-by-step approach described in Part Three allows the program manager to identify core activities/services for the local setting. This process also facilitates discussion on what activities/services are feasible within that local setting. Many of these core activities/services can be implemented in the various sectors of the HCDS. For example, the SEARCH project in India prioritized the management of neonatal sepsis at the community level[9]. In a community where program managers determined that neonatal asphyxia was a primary problem, perhaps the focus would shift to capacity-building for emergency obstetric care in institutions. In this case, the community would play a critical role in reducing delays to access.

All tools in this manual, including the Spider Web Framework, can be adapted to reflect local health problems and capacity. The Spider Web Framework can be used to assess local capacity as well as to develop overall goals for an integrated system for maternal and newborn care as discussed in Step 2 of Part Three. For the purposes of this manual, the Spider Web Framework has been adapted to emphasize the newborn. A blank Spider Web is included in the Appendix.

Further description of this tool is on the CD-ROM:
Ross, S.R. CARE's guide for the use of maternal and newborn health-planning tools. October 1999.

FIGURE 4.3
SPIDER WEB OF INTERVENTION PACKAGES BY TIME PERIOD



KEY

CORE ACTIVITIES/SERVICES (CENTER)

ADDITIONAL ACTIVITIES/SERVICES (MIDDLE)

SITUATIONAL ACTIVITIES/SERVICES (OUTER)

NOTE

These Intervention Packages are suggested only as a guide. What is appropriate in each setting depends on local problems and local capacity.

IV. INTERVENTION PACKAGES BY TIME PERIOD

A. Pre-Pregnancy Health Intervention Package

The health and behaviors of women before they become pregnant are an important foundation for improving outcomes for women and babies, as outlined in Part One. Many of the interventions for pre-pregnancy health may not have a short-term obvious impact on newborn health outcomes, such as reduced rates of neonatal mortality or LBW rate. However, these interventions may improve newborn and maternal survival and health in the long-term as well as reduce the gap in the status and education of women and the under-nutrition of female children.

Although the immediate priority must be to improve newborn outcomes as quickly and cost-effectively as possible, these long-term issues must also be addressed. Some maternal health interventions – especially family planning, addressing specific micronutrient deficiencies such as folic acid, and treating certain infections like rubella – can have a rapid, demonstrable impact on fetal-neonatal and maternal outcomes.

PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

OVERALL VISION

For women to start pregnancy in as healthy a state as possible and for the pregnancy to be wanted and well spaced.

Aims of key intervention package components during the pregnancy period.

1. Family Planning
- ☐ Delay age at first pregnancy (more than 18 years of age).
- ☐ Encourage good spacing between pregnancies (more than 24 months).

2. Preconception Nutrition
- ☐ Promote good nutritional status (pre-pregnancy weight more than 41 kg).
- ☐ Ensure that key micronutrients are replete, especially folic acid and iron.
- ☐ Prevent iodine micronutrient deficiency.

3. Infection Prevention and Treatment Among Women of Reproductive Age
- ☐ Prevent HIV and STIs, especially among adolescent girls.
- ☐ Identify and treat STIs.
- ☐ Immunize against relevant diseases, especially tetanus.
- ☐ Consider advocating for rubella immunization as appropriate.

4. Woman's Status and Education
- ☐ Increase female literacy rate.
- ☐ Enable women to participate in household decision-making.
- ☐ Improve women's access to financial resources.
- ☐ Address female genital cutting and violence against women.

The Pre-Pregnancy Health Intervention Package has four package components, which will be further discussed below, including:

A1. Package component: Family planning;
A2. Package component: Pre-pregnancy nutrition;
A3. Package component: Infections of women of reproductive age; and
A4. Package component: Status of women.

A. PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

A1. PACKAGE COMPONENT: FAMILY PLANNING

In settings with high fertility, reducing the number of pregnancies may be the single most important intervention to reduce fetal-neonatal mortality (Table 4A.1)[16].

TABLE 4A.1

PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

PACKAGE COMPONENT - *FAMILY PLANNING*

Increase coverage of family planning services

- ✔ Increase access for family planning using novel approaches, such as community-based distributors and commercial pharmacies.
- ✔ Increase demand for family planning with well-designed behavioral change programs.
- ✔ Provide effective communication about choices for delaying and spacing pregnancies.
- ✔ Involve men in addressing healthy fertility.

Increase quality of family planning services

- ✔ Provide client-centered services that respect the dignity and choice of the woman.
- ✔ Develop and implement agreed standards of care.
- ✔ Establish training and supervision systems.
- ✔ Improve the method mix of family planning options, based on informed choice.
- ✔ Strengthen logistics systems.

For more information, see the Population Report listed in Best Reading.

Panel 4.5 describes how increasing the space between pregnancies is better for the health of both the mother and the newborn.

PANEL 4.5
LESSONS LEARNED

EFFECT OF INCREASED PREGNANCY-SPACING ON NEONATAL AND INFANT MORTALITY

Researchers from Macro International used data from Demographic and Health Surveys in 17 countries to analyze the relationship between infant and perinatal mortality and birth intervals. Results show that birth intervals three years or longer substantially decrease the risk of infant, neonatal, and fetal deaths compared to those of either two years or less than two years. Shorter birth intervals were associated significantly with low birth weight.

Estimates were made of the number of deaths that could be averted through birth spacing. In India, for example, about 60 percent of birth intervals are shorter than 36 months, and 25 percent are shorter than 24 months. If the minimum birth interval increased to 24 months, the IMR (infant mortality rate) would drop from 71.6/1,000 live births to 55.49/1,000 live births. A half of a million deaths per year, or 23 percent of infant deaths in India, would be averted. If the minimum birth interval shifted even further to 36 months, additional gains in infant health would occur. The IMR would drop from 71.6/1,000 live births to 51.12/1,000 live births. Also, 780,000 infant deaths, or 29 percent of India's infant deaths, would be averted.

Interestingly, the average birth-spacing interval desired by women in all of the countries studied was longer than the current national average. The actual average birth interval in India is 31.1 months, and the interval preferred by Indian women is 35.4 months. By enabling women to realize their birth-spacing preferences, infant deaths would also be markedly reduced.

Source: Rustein[18].

A. PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

A2. PACKAGE COMPONENT: PRECONCEPTION NUTRITION

Low pre-pregnancy weight (less than 41 kg) and stunting of the mother's growth are some of the strongest predictors of LBW. However, this is a complex issue because deeply ingrained behaviors often relate to nutrition of the female child. A life-cycle approach is required to address these behaviors through several generations and this problem is important in the long-term, from both a human rights and a health-outcome standpoint, as discussed in Part One. However, there is little evidence about the programs, with the exception of folic acid supplementation. In a setting with a high rate of neural tube defects, folic acid can make a significant difference in fetal-neonatal outcomes. Given the necessary public policy support and capacity for implementation, results can be achieved in a short period of time. Table 4A.2 outlines the key issues to be aware of in terms of micronutrient deficiencies and treatment.

TABLE 4A.2

PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

PACKAGE COMPONENT – *PRECONCEPTION NUTRITION*

Protein-energy supplementation

Protein-energy supplements are effective in improving outcomes for the newborns of under-nourished women during pregnancy. However, few programs have been developed to address pre-pregnancy weight increase and document improvements in LBW rate. More research is needed in program settings to see if this is effective and how best to implement supplementation within programs.

Micronutrient supplementation

✔ **Folic acid**

Peri-conceptional folic acid is highly effective in preventing neural tube defects, but its effect on LBW remains uncertain.

- Take 2 mg daily for 3 months before pregnancy and until week 12 of gestation.

✔ **Iodine**

Iodine is important in preventing mental impairment or cretinism, but the effect of mild iodine deficiency on LBW is unclear.

- Prevent iodine deficiency by iodization of salt.
- Treat iodine deficiency with iodized oil, 0.5 mL single dose.

✔ **Iron**

In developing countries, 32-49 percent of women are anemic (hemoglobin less than 12.0 g/dL), mainly with iron deficiency anemia, before pregnancy.

- Prevent iron deficiency with better diet and intermittent treatment of hookworm.
- Treat iron deficiency with 120 mg of elemental iron daily.

✔ **Vitamin A**

- Prevent Vitamin A deficiency with better diet. Good sources of Vitamin A include dark green, leafy vegetables; dark yellow fruits and vegetables, such as mangos, papaya, pumpkin, ripe squash, carrots, sweet potatoes, apricots, and cantaloupe; and margarine, eggs, and other dairy products.
- Treat Vitamin A deficiency with 10,000 IU daily.

Source: UNACC/SCN[19].

Panel 4.6 describes an intervention in China to prevent neural tube defects.

PANEL 4.6
LESSONS LEARNED

PREVENTING NEURAL TUBE DEFECTS WITH FOLIC ACID IN CHINA

Folic acid is very effective in preventing neural tube defects (NTDs) in babies; adequate intake cuts the risk in half. One region in northern China was noted to have a very high rate of neural tube defects, the single largest cause of neonatal deaths in this region. Recently Berry and the US-Chinese Neural Tube Defect Prevention Group evaluated the effect of a public health campaign promoting folic acid consumption by newly married women in two regions of China, one in northern China with a high NTD incidence and one in southern China with a low NTD incidence.

Women in both regions were asked to take a pill containing only 400 mg of folic acid daily from the time of their premarital examination until the end of their first trimester of pregnancy. For women who did not take any folic acid, the rates of NTDs were 4.8 per 1000 pregnancies in the northern region and 1.0 per 1,000 in the southern region. For women taking peri-conceptional folic acid, the rates were 1.0 per 1,000 in the northern region and 0.6 per 1000 in the southern region. The greatest reduction of risk occurred among the fetuses or infants of a subgroup of women in the northern region (where baseline incidence was high) who took folic acid pills more than 80 percent of the time from marriage until the end of the first trimester.

This study concluded that peri-conceptional intake of 400 mg of folic acid daily can reduce the risk of NTDs in areas with high rates of these defects and in areas with low rates. In settings where many pregnancies are not planned, the promotion of peri-conceptual folic acid may be more complex.

Source: Berry et al[20].

A. PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

A3. Package Component: Infection among women of reproductive age

Infections, especially STIs, are responsible for a significant burden of disease for women. The key period for prevention is during adolescence and young adult life. About half of the new HIV infections in sub-Saharan Africa each year occur in adolescents[21]. Prevention is crucial because there is no cure for AIDS. Improved prevention, identification, and treatment of other STIs would help reduce new HIV infections and would directly benefit women and babies. HIV is discussed in more detail in Part One and under Essential Newborn Care.

Targeting women of reproductive age (WRA) for immunization is an important strategy, especially to increase tetanus toxoid coverage in settings where the majority of girls attend school and school-based programs are feasible. If rubella immunization is policy, coverage of adolescent girls is crucial to avoid congenital rubella syndrome[22]. Rubella vaccine is not recommended for administration to pregnant woman. However, the risk of congenital abnormalities from the vaccine is considered so negligible that inadvertent administration during pregnancy is not an indication for termination of pregnancy[22]. Table 4A.3 outlines some of the key activities to think about when trying to address infections among WRA.

TABLE 4A.3

PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

PACKAGE COMPONENT – *INFECTIONS*

Prevent sexually transmitted infections

STIs, including HIV, have a devastating effect on women and babies. In sub-Saharan Africa, about half of new HIV and STI infections occur in adolescents, and at least half are in girls. Prevention is crucial.

- ✔ Delay age at first intercourse through behavioral change, policy support, and community mobilization.
- ✔ Strengthen healthy sexual behaviors, such as having one partner.
- ✔ Promote condom use and ensure consistent supply.
- ✔ Reduce prevalence by quality treatment and partner tracing.

Identify and treat sexually transmitted infections

- ✔ Implement effective behavioral change programs that promote recognition of STIs and health-seeking behavior.
- ✔ Improve partner tracing for STIs.
- ✔ Build the clinical capacity of the health system to identify and treat STIs.
- ✔ Build the laboratory capacity of the health system to investigate STIs at least at the regional level.
- ✔ Develop and implement national policies for screening and treatment for STIs and HIV.
- ✔ Strengthen logistics systems related to STI services, including testing supplies and drugs for treatment.

Immunize women of reproductive age against key infections

- ✔ Ensure that women of reproductive age have had at least two tetanus toxoid immunizations.
- ✔ Consider advocating for policy change for rubella immunization (covering only women of reproductive age or covering all infants) depending on the national burden of congenital rubella syndrome and the capacity to maintain high immunization coverage (more than 80 percent).
- ✔ Consider including hepatitis B immunization as a standard of care depending on national policy. If hepatitis B immunization is not supported by national policy but the burden of hepatitis B-related disease is high, consider advocating for policy change.

Source: WHO/V&B/00.[10,22], AIDSCAP[23], UNAIDS[24].

A. PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

A4. PACKAGE COMPONENT: STATUS AND EDUCATION OF WOMEN

Investment in the literacy of women is an important long-term strategy to improve the health and well-being of women and infants as well as society in general. Although this investment may not result in immediate improvement in newborn survival, over time mortality rates will decrease.

TABLE 4A.4

PRE-PREGNANCY HEALTH INTERVENTION PACKAGE

PACKAGE COMPONENT – *STATUS AND EDUCATION*

Improve education

- ✔ Increase school enrollment for all children through community mobilization.
- ✔ Reduce the gender literacy gap by strengthening educational opportunities for girls and women.
- ✔ Advocate for regional and national opportunities for girls to attend higher levels of education.

Increase access to income for all women

- ✔ Expand and strengthen micro-finance schemes.
- ✔ Promote business training and cooperative businesses for women.
- ✔ Use community mobilization to empower women to negotiate for access to family resources.
- ✔ Implement behavioral change programs addressing male responsibility to commit resources to the family.

Increase the general status of women in the home and community

- ✔ Empower women's groups to identify key rights to negotiate for at the household and community levels.
- ✔ Enable women who have status in the community to empower others with negotiation skills ("positive deviance").
- ✔ Build on strengths from micro-finance schemes and increased female literacy to promote women's concerns at the community level.

Source: World Bank[25].

B. Care During Pregnancy Intervention Package

Care during pregnancy includes the care of the woman and her fetus both in the home and community and in the formal health care sector, particularly at the antenatal clinic. Although most pregnancies are "normal" where mothers and babies survive, any woman or newborn can develop complications. Appropriate care during pregnancy provides individuals and communities with information and an enabling environment to promote healthy choices. Health care should also help women and their communities recognize and avoid harmful practices. It is important for all individuals concerned to recognize danger signs and respond quickly.

At the household level, it is important to plan for a healthy birth and to develop an action plan for possible complications. Other key issues include workload and nutrition for the pregnant woman in addition to planning for delivery. In many settings, the mother is expected to continue a heavy workload until full term. This may contribute to preterm labor and/or a factor in intrauterine growth restriction. Research trials in low-resource settings showed that giving the mother protein-energy supplementation during pregnancy resulted in a significant reduction in LBW rate and fetal-neonatal mortality[26]. However, reviews of programs addressing nutrition in pregnancy have not found such effects, and nutritional supplementation has not been tested in a large-scale program[19].

In the formal health care system, the contribution of antenatal care to improving outcomes is unclear. The lack of clarity of the effect of antenatal care may be because the quality of care is variable[27]. Many antenatal clinic visits of low-quality care may not change outcomes, whereas even a few visits where standard protocols of care are followed may have a big impact. Four visits with evidence-based care is adequate in a normal pregnancy[28].

CARE DURING PREGNANCY INTERVENTION PACKAGE

OVERALL VISION

To provide quality care during pregnancy in order to prevent complications of pregnancy, identify and manage danger signs, and to prepare for delivery and motherhood.

Aims of key interventions during pregnancy.

1. Provision of Evidence-based, Client-centered Antenatal Care

- ☐ Increase coverage of antenatal care services.
- ☐ Improve the quality of antenatal care.
- ☐ Rapidly recognize and manage severe hypertension or pre-eclampsia.
- ☐ Identify and manage complications and major risks at delivery (e.g., multiple birth, malpresentation).

2. Improved Nutrition in Pregnant Women

- ☐ Promote iron and folate supplementation for all pregnant women.
- ☐ Provide targeted protein-energy supplementation as appropriate.
- ☐ Consider micronutrient supplements, such as iodine and Vitamin A, depending on local setting.

3. Address Anemia in Pregnancy

- ☐ Prevent anemia with good diet, iron and folate supplementation and presumptive treatment of malaria and hookworm if indicated.
- ☐ Identify and treat severe and moderate anemia.

4. Prevention and Treatment of Infections in Pregnant Women

- ☐ Identify and treat STIs, especially syphilis and gonorrhea.
- ☐ Institute presumptive treatment for malaria/hookworm in endemic areas.
- ☐ Provide voluntary testing and counseling for HIV, if locally appropriate.
- ☐ Ensure tetanus toxoid immunization coverage of all pregnant women.

5. Promotion of birth planning

- ☐ Educate women/communities about danger signs for the mother and newborn.
- ☐ Enable women to choose a skilled provider and to ensure clean materials for delivery.
- ☐ Encourage mothers, fathers, and families to prepare for (transport) potential complications during delivery or in the newborn.
- ☐ Address transport difficulties with use of community participatory methods.
- ☐ Help the mother and family prepare for care of the newborn, especially regarding early and exclusive breastfeeding and avoiding harmful practices.
- ☐ Enable the HIV-positive mother to plan options to reduce the risk of transmission to her newborn, including presenting the balance of risks for breastfeeding.

The Care During Pregnancy Intervention Package has five package components, which will be further discussed below.

B1. Package component: Provide client-centered ANC services.
B2. Package component: Improved nutrition in pregnancy.
B3. Package component: Prevention and treatment of anemia in pregnancy.
B4. Package component: Prevention and treatment of infections in pregnancy.
B5. Package component: Promotion of birth planning.

B. CARE DURING PREGNANCY INTERVENTION PACKAGE

B1. PACKAGE COMPONENT: PROVIDE CLIENT-CENTERED ANC SERVICES

Specific interventions in care during pregnancy that are effective in improving outcomes for the fetus/neonate, mother, or both include:

- administering tetanus toxoid immunization (minimum of two doses, unless there is evidence of four previous doses providing lifetime immunity)[29];
- screening for and treating STIs, especially syphilis[30, 31];
- screening for and treating urinary tract infections[31];
- providing presumptive treatment of malaria[32] and hookworm[33] in endemic areas;
- detecting (early) and managing pre-eclampsia[27];
- detecting (early) and managing major risk factors for obstructed labor, based on previous history of prolonged/obstructed labor[31];
- providing protein-energy supplementation to undernourished women[26]; and
- promoting birth planning and emergency preparedness.

Many practices carried out in antenatal clinics have limited or no evidence of benefit. Sometimes health personnel may spend most of their time weighing every woman, which may not change outcomes for the mother or the baby. This practice may leave little time to invest in activities that do make a difference, such as screening for STIs or birth planning. There is strong evidence of benefit from tetanus toxoid immunization. However, only about one-third (33%) of women in developing countries receive two or more immunizations. In addition, many opportunities are missed to immunize women even in the antenatal clinic. Very busy clinics with long waiting times and little real dialogue between the women and the attendants reduce motivation for women to return to the clinic again or to deliver with a skilled attendant.

It is not possible to develop global guidelines for antenatal care that are appropriate and feasible in every setting. Generic guidelines have to be adapted at national and local levels in response to local problems and capacities. However, it is crucial that local standards are developed through consensus of the major stakeholders (i.e., clinicians, professional groups of obstetricians and midwives, Ministry of Health, etc.) and that all the health care personnel and other relevant personnel are aware of these standards and able to carry them out. The process of development of standards can be facilitated by starting with an agreed international standard such as WHO's Management of Complications in Pregnancy and Childbirth. The standards are no use unless staff are trained to competency level, and the content is standards is clear. This may involve displaying posters on walls, having written copies of standards, as well as training and supervising staff. Some of the issues that need to be included in standards are listed on in the Table 4B.1 "Quality Care During Pregnancy". The details of clinical guidelines are in the documents on the CD-ROM; hypertensive disease in pregnancy is outlined in more detail.

Hypertension in pregnancy: Pre-eclampsia can lead to eclampsia, resulting in convulsions. Pre-eclampsia and eclampsia are more common in primigravidas (women in their first pregnancy). The condition is often associated with a rise in diastolic blood pressure above 90 mm Hg, generalized swelling (edema) in the hands and face, protein in the urine, and overactive reflexes. Screening parameters, such as a rise in blood pressure, generalized edema, proteinuria, and hyperreflexia, do not always predict pre-eclampsia, and preclampsia or eclampsia may occur without these signs. However, these signs should always be taken seriously and acted upon promptly. If any of these symptoms are present, women should be encouraged to go to a health institution with a skilled provider and emergency obstetric capacity immediately.

WHO recommends that blood pressure should be measured monthly in the second and third trimesters. Women need to be closely monitored for generalized swelling in the arms and face (not ankles) and for urine protein, if feasible. Treatment of preeclampsia/eclampsia includes: 1) administration of magnesium sulfate (see MCPC on CD-ROM for the dosing schedules); 2) administration antihypertensives if required; and 3) bed rest in a calm environment. Women at risk of developing eclampsia (history of pre-eclampsia) appear to benefit from low-dose aspirin (150 mg) daily, although the best time to start this has yet to be established. Regular calcium supplements have also been shown to be beneficial for women at high risk of hypertension, although this is still somewhat controversial[27].

TABLE 4B.1

CARE DURING PREGNANCY INTERVENTION PACKAGE

PACKAGE COMPONENT – *PROVIDE CLIENT-CENTERED ANC SERVICES*

Increase coverage of care during delivery services

- ✔ Increase demand for care during pregnancy with well-designed behavioral change programs.
- ✔ Address unmet need for care during pregnancy by increasing access points and using outreach services.
- ✔ Evaluate and address other barriers, such as acceptability (i.e., offering only male doctors), affordability, or overly long waits.

Increase quality of services offering care during pregnancy

- ✔ Provide client-centered services that respect the dignity of women and improve client-provider dialogue.
- ✔ Develop and implement locally agreed upon standards of care that address the number of care during pregnancy visits, remembering that fewer visits with good care have more effect than many low-quality visits. WHO recommends a minimum of four visits with increased quality of care at each visit.
- ✔ Develop and implement locally developed standards for content of care during pregnancy, including detailed outlines for the first visit and follow-up visits. These local standards should provide clear guidelines for the following:

  History – What to ask? How to record information and the decisions that flow from this information (i.e., previous late fetal death should trigger syphilis screening (if not routine) and extra visits)?

  Examination – What to examine? What equipment is needed? How do you best use the equipment (i.e., little evidence supports routine weighing of women in antenatal clinics)?
  What response should be triggered by the abnormal findings on examination (i.e., twins should trigger careful counseling and a plan for institutional delivery)?

  Investigations – What tests are important and feasible in your setting (i.e., syphilis screening)? Is it possible to have results immediately? If not, how will women with abnormal test results be traced?

  Treatment – What routine treatment will be recommended? Will patients pay for all treatment? What essential drugs will be on site (i.e., syphilis treatment)? How will a consistent supply of drugs be ensured?

- ✔ Establish training, supervision, and reward systems to promote quality.
- ✔ Strengthen logistics systems, such as supplies for investigations, drugs, or equipment.

TABLE 4B.1

CARE DURING PREGNANCY INTERVENTION PACKAGE

PACKAGE COMPONENT – *PROVIDE CLIENT-CENTERED ANC SERVICES (cont.)*

Include core services in standards of care

- ✔ Develop systems for early detection and management of complications of pregnancy, especially pre-eclampsia, malpresentation, preterm labor, and prelabor rupture of membranes.
- ✔ Provide iron/folate supplementation (60 mg elemental iron).
- ✔ Provide tetanus toxoid immunization (minimum of two doses unless evidence of four previous doses, which would provide lifetime immunity to tetanus).
- ✔ Provide testing and treatment for STIs, especially syphilis, as appropriate.
- ✔ Promote birth planning (see Table 4B.5).

Address situational problems in standards of care

- ✔ Institute presumptive treatment of malaria in endemic areas (see Table 4B.3).
- ✔ Institute presumptive treatment of hookworm in pregnancy in endemic areas (see Table 4B.3).
- ✔ Develop locally feasible standards for investigation and treatment of syphilis and other STIs in pregnancy in areas with high prevalence. (Note: data on STI prevalence are often lacking/unreliable, so the program manager need to have ***evidence*** that the STI is ***not there,*** especially regarding syphilis in sub-Saharan Africa.)
- ✔ Provide voluntary counseling and testing for HIV, if appropriate (see Table E1.8).

Advocate for policy support in implementing standards of care

- ✔ Increase coverage and quality of care through policy support from MOH and other sectors.

Source: WHO/RHR/00.[77], WHO/FHE/MSM/94.[11,34], JHPIEGO/BASICS [35].

B. CARE DURING PREGNANCY INTERVENTION PACKAGE

B2. PACKAGE COMPONENT: NUTRITION IN PREGNANCY

Two important determinants of birth weight are pre-pregnancy weight of the mother and weight gain during pregnancy. Pre-pregnancy weight of less than 41 kg has been shown to be a contributing factor for LBW[19]. Weight gain during the second and third trimesters of pregnancy (22 to 40 weeks) is more important than weight gain during the first trimester. WHO recommends that a women should gain at least one kg per month for the last two trimesters, resulting in a weight gain of six kg. The Institute of Medicine Report on Nutrition in Pregnancy recommends a total weight gain of 12 kg. The WHO recommendation of six kg, is an attempt to create an achievable goal. The sad reality is that many pregnant women do not even achieve the 6 kg goal, due to low energy intake and continued high workload.19 The key issues for nutrition in pregnancy are listed in Table 4B.2.

Regular weighing of women is not feasible in many settings and has not been shown to affect newborn outcomes. This is probably because even if poor weight gain is detected it rarely leads to a specific intervention. One study in the Gambia, where locally baked peanut biscuits were provided to pregnant women, showed a significant gain in birth weight and about a 50 percent reduction in perinatal mortality (Panel 4.7)[26]. Replication of similar interventions should be feasible in other programs and has the potential for a dramatic impact on fetal-neonatal outcomes.

PANEL 4.7

LESSONS LEARNED

PEANUT COOKIES, PREGNANCY, AND REDUCED PERINATAL MORTALITY

There has been controversy as to whether dietary supplementation during pregnancy can increase birth weight. A study was completed in a poor, rural area in Gambia where food is scarce, especially in the dry, or "hungry," season. The LBW rate was around 18 percent. The aim of the study was to test the effect of an inexpensive dietary supplement provided to pregnant women under realistic field conditions through the primary health care system.

Ceesay et al.[26] conducted a 5-year trial, randomizing all pregnant women in 28 villages to daily supplementation with high-energy groundnut biscuits (4.3 megajoules per day) for about 20 weeks before delivery (intervention group) or after delivery (control group). The biscuits were cooked in the village and delivered to the mother by the village health worker.

Supplementation before delivery increased weight gain in pregnancy and significantly increased the birth weight of the baby by an average of 136 grams, thereby reducing the LBW rate by 35 percent. Supplementation also significantly reduced perinatal mortality. Stillbirths were reduced by about 53 percent and early neonatal deaths by 46 percent. The babies' head circumferences were only slightly increased, and there was no evidence of increased risk for obstructed labor[37].

The study concluded that this low-cost, locally sustainable prenatal dietary supplementation reduced IUGR and perinatal mortality. The intervention was successfully delivered through a primary health care system.

Source: Ceesay et al.[26], Garner and Kramer[37].

Many micronutrients have been studied in terms of effect on maternal, fetal and neonatal outcomes. The following text and Table 4B.2 summarize the current evidence regarding the most important micronutrients during pregnancy.

Iodine: Iodine is needed for adequate physical and mental development of the fetus. Iodine deficiency increases the chances of miscarriage, stillbirth, and premature birth. A child born to an iodine-deficient mother is more likely to have mental retardation, cretinism, and poor muscle coordination. About 250 million women suffer the effects of iodine deficiency, and nearly one-third of Africans (181 million) live in iodine-deficient areas[34].

Salt iodization is the optimal way of preventing iodine deficiency and should be the primary focus for preventing iodine deficiency disorders. The recommended dietary intake for pregnant and lactating women is 200 mg/day. In 1996, WHO hosted an expert panel to look at the safety of giving iodine oil to pregnant women with iodine deficiency disorders. This panel concluded that for preventing and controlling moderate and severe iodine deficiency disorders, administration of iodized oil is safe at any time during pregnancy. The specific recommendations are given in Table 4B.2[43].

Vitamin A: Vitamin A is important for growth, development, and immune function. Although the increased Vitamin A requirement during pregnancy is quite small, in countries where Vitamin A deficiency is endemic, women need supplementation[41]. If more than one percent of the total population of children less than five years of age are diagnosed with Vitamin A deficiency, the prevalence is high and indicates a significant problem. Pregnant women with Vitamin A deficiency often display varying levels of night blindness (i.e., not being able to see in dim light), which is easy to treat with Vitamin A supplementation. No study has clearly shown that Vitamin A increases birth weight. A study in Tanzania compared pregnancy outcomes and MTCT/HIV for groups of HIV-positive pregnant women taking either Vitamin A or multivitamins. The study found Vitamin A had no significant effect on fetal-neonatal survival. In the multivitamin group, the risk of fetal death, LBW and pre-term birth was reduced by half. One study in Nepal found a dramatic reduction in maternal mortality for women taking Vitamin A supplements[42].

Vitamin A supplementation during pregnancy has raised concerns because of its potential to cause birth defects if taken in high levels. Both severe Vitamin A deficiency and Vitamin A toxicity can cause birth defects, especially if either occurs early in pregnancy. In June 1996, WHO convened a meeting on "Safe Vitamin A Dosage during Pregnancy and the First Six Months After Birth". The recommended doses from this meeting are summarized in Table 4B.2[41].

Calcium: A study of calcium supplementation during pregnancy (two grams daily from 20 weeks of gestation) given to first-time mothers at risk of hypertension resulted in a reduction in preterm birth and an increase in birth weight. It is advised to give calcium to women at high risk of hypertension in pregnancy who live in communities with low dietary intake of calcium[27]. However, generalized recommendations for calcium are not justifiable on the evidence available to date.

Magnesium sulfate: The current recommendation is to give magnesium sulfate to women with pre-eclampsia or eclampsia (the full dosage regimen is given in MCPC[7] page S45).

Zinc: Some cross-sectional studies have found an association of low maternal levels of zinc with LBW and preterm birth, but evidence from randomized controlled trials of zinc supplementation have been less convincing. More studies are needed before zinc can be routinely recommended in pregnancy[19]. In contrast, the benefits of zinc in reducing morbidity and mortality due to early childhood infections are not in doubt[44].

Multiple micronutrient supplementation: Pregnant women in industrialized countries commonly take multivitamin supplements. However, few studies have examined this practice closely. Several cross-sectional studies have suggested that multivitamins reduce the risks of preterm birth, LBW, and congenital abnormalities. One randomized controlled trial among HIV-positive women in Tanzania found that multivitamins and mineral supplements decreased LBW by 44 percent and preterm birth (less than 34 weeks gestation) by 39 percent[45]. The results of a randomized controlled trial of multivitamin-mineral supplementation in rural Mexico are not yet available. A general recommendation cannot be made for supplementation based on the current evidence.

Trials investigating micronutrient supplementation in industrialized countries may be complicated by the fact that most women are not markedly deficient. On the other hand, trials in developing countries may be complicated by the fact that a woman who is deficient in many micronutrients may not benefit from receiving another single micronutrient alone. Supplementation with iron and folate, but not with zinc, may be of limited advantage for women who are deficient in all three[46].

More information is available on the CD-ROM.

TABLE 4B.2

CARE DURING PREGNANCY INTERVENTION PACKAGE

PACKAGE COMPONENT – *NUTRITION IN PREGNANCY*

Protein-energy supplementation

Protein-energy supplements for undernourished women during pregnancy have been shown to be effective in increasing birth weight and reducing perinatal mortality. However, few programs have documented effects on LBW rate or other outcomes for the fetus/neonate. More research is needed in program settings to see if protein-energy nutrition interventions are feasible and effective and to determine how to implement them.

Micronutrient supplementation

✔ **Folic acid**

Preconceptional folic acid is highly effective at preventing neural tube defects. Its effect on LBW is uncertain.

- Take two mg daily for three months before pregnancy and until week 12 of gestation.

✔ **Iodine**

Iodine is important in preventing mental impairment or cretinism, but the effect of mild iodine deficiency on LBW is unclear.

- Prevent iodine deficiency by iodization of salt.
- Treat iodine deficiency with iodinized oil 0.5 mL single dose (safe in pregnancy).

✔ **Iron**

In developing countries, 24-76 percent of pregnant women are anemic (hemoglobin less than 11.0 g/dL).

- Prevent iron deficiency with better diet and intermittent presumptive treatment of hookworm (see Table 4B.3).
- Give iron supplementation during pregnancy (60 mg per day).
- Treat iron deficiency with 120 mg of elemental iron daily.

TABLE 4B.2 (continued)

CARE DURING PREGNANCY INTERVENTION PACKAGE

PACKAGE COMPONENT – *NUTRITION IN PREGNANCY (cont.)*

✔ **Vitamin A**

The role of Vitamin A supplementation during pregnancy is still controversial.

- Prevent Vitamin A deficiency with better diet. Good sources of Vitamin A include dark green, leafy vegetables; dark yellow fruits and vegetables, such as mangos, papaya, pumpkin, ripe squash, carrots, sweet potatoes, apricots, and cantaloupe; and margarine, eggs, and other dairy products.
- Provide 10,000 IUs of Vitamin A oral supplementation daily in the second or third trimester if Vitamin A deficiency in children is more than one percent locally.
- In settings where women's intake meets or exceeds RDA amount (8,000 IUs), there is no justification for a supplement above 8,000 IUs. Supplements could be dangerous to this population.
- Postpartum women should receive a single high dose of 200,000 IUs in the first month after delivery.

✔ **Magnesium sulfate**

Magnesium sulfate is the treatment of choice for pre-eclampsia and eclampsia.

- Provide magnesium sulfate to pregnant women with current pre-eclampsia or eclampsia. The loading dose, maintenance, and other considerations are detailed in MCPC[7] page S45.

✔ **Calcium**

- Provide calcium supplementation for women who are at high risk of hypertensive disease of pregnancy and who live in communities with low dietary calcium intake.

✔ **Zinc**

The benefits of zinc supplementation during pregnancy are still unclear.

✔ **Multiple micronutrients (i.e., multivitamins)**

A general recommendation cannot be made for supplementation based on the current evidence.

Source: UNACC/SCN[19], Ramakrishman[38], Tinker et al.[39], Kramer[40].

B. CARE DURING PREGNANCY INTERVENTION PACKAGE

B3. PACKAGE COMPONENT: ANEMIA IN PREGNANCY

Anemia (hemoglobin of less than 11 gm/dL) affects between 24 and 76 percent of pregnant women globally[47]. Anemia has many causes, but the major cause in women of reproductive age is iron deficiency due to inadequate diet, low absorption of iron, or iron loss. Other nutrient deficiencies, such as folic acid and Vitamins A and C, also contribute to anemia. In many areas, malaria and hookworm are major causes of anemia.

Severe anemia (hemoglobin less than7gm/dL) has been shown to increase the mother's risk of death[32]. Iron deficiency anemia in the mother increases the risk of LBW by three-fold and of preterm birth by two-fold[48]. A recent Cochrane review concluded that iron and folate both separately and together increase maternal hemoglobin during pregnancy[49]. No study has definitively shown an improvement in maternal or fetal-neonatal outcomes due to iron or folate supplementation. The possibility of future studies is complicated because it would be considered unethical to have a control group of women not receiving iron. One small randomized study in Niger gave iron supplements or placebo during pregnancy and showed an increase in neonatal iron levels but no significant difference in birth weight or perinatal/neonatal mortality[50].

In settings where anemia prevalence is high (more than 40%), it is more cost-effective to treat all women with iron and folate than to test women. This is due to the fact that iron is very inexpensive and laboratory testing is often not available or expensive. Examination by pallor screening (examining the inner lower eyelids, conjunctiva, palms, and nailbeds for paleness) is useful in detecting severe anemia (hemoglobin less than7 gm/dL). Studies have found that using this screening method is not very effective in identifying mild or moderate anemia. It is essential to identify women with severe anemia to ensure they are referred and properly treated, but identification is complex in settings with little or no investigation available. More details on the detection and investigation of anemia in low resource settings are available in a useful manual by PATH[51].

Iron supplementation of 60 mg daily in combination with 250 mg of folic acid is recommended for all pregnant women. In settings where anemia is endemic, it is recommended to give all pregnant women a dose of 120 mg of iron with 500 mg of folic acid. Yet few women actually receive and take the tablets regularly[53]. There are many reasons for this, but the key solutions include the following:

- ensuring that staff are aware of the policy for iron and folic acid supplementation;
- improving supply logistics of iron and folic acid tablets;
- selecting tablets that are acceptable to clients with the best profile for side-effects; and
- communicating to clients the importance of taking the tablets and what to do to minimize side effects.

Table 4B.3 outlines the key activities to prevent and/or treat anemia in pregnant women. Panel 4.8 outlines some African programs that have been effective in dealing with malaria during pregnancy.

TABLE 4B.3

INTERVENTION PACKAGE – CARE DURING PREGNANCY

PACKAGE COMPONENT – *ANEMIA IN PREGNANCY*

Definition

Anemia is a condition in which the hemoglobin level is less than the expected level based on age, sex, and gestation of pregnancy. After the 12th week of pregnancy, anemia is defined as hemoglobin of less than 11 gm/dL; severe anemia is a hemoglobin level less than 7gm/dL. There are many causes of anemia but the most common cause, especially in women of reproductive age, is iron deficiency.

Investigations

In settings where 40 percent or more of pregnant women are anemic, it is more cost-effective to treat all pregnant women than to test routinely. Certain women, especially those with severe anemia (less than 7 gm/dL), may require further investigation, such as:

- ✔ hemoglobin level; and
- ✔ blood film (which can suggest underlying causes such as iron deficiency or sickle cell disease).

Specific treatment

For iron deficiency anemia, treat with 120 mg of elemental iron and 500 mg of folic acid daily. Women with severe anemia require further investigation and may require a blood transfusion. Other causes, such as malaria, should be treated appropriately.

Prevention

- ✔ **Good diet -** Iron is contained in two types of food: heme and nonheme sources. Heme sources provide iron that is most easily digested; good sources are red meat and organ meat. Good nonheme sources include dark green, leafy vegetables, molasses, egg yolks, dried fruit, and legumes. Iron absorption is enhanced by eating foods high in Vitamin C (i.e., fruits) and avoiding consumption of coffee, tea, or chapati flour at the same time. Iron fortification of grains (i.e., cereals, breads) can also be a strategy in some settings.

- ✔ **Delay age of first pregnancy** and space pregnancies by at least two years. Avoid breastfeeding while pregnant because this drains the body's iron stores.

- ✔ **Provide iron** (60 mg daily) and folate (250 mg daily) supplements during pregnancy and promote their use.

- ✔ **Treat hookworm** presumptively during pregnancy in endemic areas. Do not give sulfadoxine-pyrimethame in the first trimester. WHO suggests that all primigravidas receive sulphadoxine-pyrimethamine (three tablets) monthly for the second trimester. If HIV prevalence is high, give sulphadoxine-pyrimethamine (three tablets) monthly to all women from the second trimester.

- ✔ **Treat malaria** presumptively during pregnancy in endemic areas depending on the national protocol.

Source: Atukorala et al.[33], PATH[51], Shulman et al.[54].

PANEL 4.8
LESSONS LEARNED

MOSQUITOES, MALARIA, AND MOTHER-BABY OUTCOMES



In areas where malaria is endemic, it is a major cause of severe maternal anemia and is estimated to cause three to five percent of neonatal mortality. The risks of adverse health outcomes are especially high in a woman's first pregnancy. Malaria during pregnancy is often asymptomatic, so treating only women with symptoms will miss most cases.

Many sub-Saharan African countries have previously had a policy of weekly chloroquine prophylaxis for pregnant women. However, compliance with this regimen has been typically low and chloroquine resistance is now very common. Insecticide-treated bed nets have not had a significant benefit for the pregnant women in highly malaria endemic areas despite the dramatic benefits that have been shown for children aged less than five years. Benefits of mosquito nets during pregnancy may be greater in areas of seasonal transmission[54].

Kilifi is mainly a rural district in Kenya with high rates of malaria transmission. Hookworm infection is also common with 75 percent of women infected. A study was carried out, and 1,264 women were randomized to receive either sulphadoxine-pyrimethamine (S-P) or placebo monthly. They received one, two, or three doses depending on the month of pregnancy which they started care.

The women who received S-P had 85 percent less malaria, and the rate of severe anemia (defined as less than 7 gm/dL) was reduced by almost half. Even women who only attend one ANC visit, receiving one S-P dose, still benefited. Perinatal deaths were also reduced by 22 percent and neonatal deaths by 38 percent, although this reduction was not statistically significant. No serious side effects were detected, although there is a small risk of reaction to sulpha-containing drugs.

Kenya has now changed the national policy so that all women in their first pregnancy receive monthly S-P in an antenatal clinic. For HIV-positive women, the risk of severe malaria in pregnancy does not decline with subsequent pregnancies. Since most Malawians do not know their HIV status, the policy-makers in Malawi decided that it would be simpler to give S-P to all pregnant women, an approach that remains inexpensive because S-P costs about 19 US cents per dose, up to three doses.

Source: Shulman[32], Shulman et al.[54].

B. CARE DURING PREGNANCY INTERVENTION PACKAGE

B4. PACKAGE COMPONENT: INFECTIONS IN PREGNANCY

In areas where STIs are common, they are an important cause of adverse maternal outcome (i.e., sepsis) and adverse fetal-neonatal outcomes, such as stillbirths, IUGR, preterm birth, neonatal infections, and mortality. Identification and management of STIs at antenatal clin are often neglected due to:

- poor-quality information on local rates of various STIs;
- lack of recognition of the importance of STIs on outcomes for both mother and baby (summarized in Table 1.7);
- difficulties identifying or testing for STIs in women; and
- lack of clarity on treatment protocols or lack of drugs for treatment.

The relative importance of STIs and other maternal infections varies around the world. Group B streptococcus is important in industrialized countries and may be of increasing importance in some transitional countries[55]. Neonatal sepsis and meningitis with Group B streptococcus are very seriou conditions that can be prevented by giving an infected (asymptomatic) mother a single dose of peni cillin before delivery. Given the low prevalence of Group B streptococcus in developing countries an the logistical difficulties of screening and treatment, this preventive measure is unlikely to become policy in these settings. Bacterial vaginosis is an important cause of preterm birth in the United State but it is not included here since the burden in developing countries is largely unknown, and investig tion and treatment may not be feasible in low-resource settings in the foreseeable future.

Investigation and treatment for selected infections are outlined in Table 4.2. Many STIs are asymp tomatic in women. The only sure way to know whether a pregnant woman is infected is to test h In settings where women attend an antenatal clinic only a few times, using tests with "instant" results can be very useful. These tests allow an opportunity to immediately treat more women. It may also enhance partner tracing[57]. Several organizations, particularly PATH, are currently devel oping less expensive, reliable, "instant" tests, especially for syphilis. The most important STIs to identify in order to improve fetal-neonatal and maternal outcomes are the following.

Syphilis: The options for investigation are listed in Table 4.2. The most inexpensive (about 30 US cents per test) and most widely used is rapid plasma reagin, but it is more difficult to get rapid results from this test. Tests that allow "instant" results increase the proportion of women treated but are more expensive (US$1.40 per test). Cheaper alternatives are being developed. Panel 4.9 describes a prenatal syphilis screening program in Mozambique.

Gonorrhea and chlamydia: Many women are asymptomatic, and testing is currently unavailable in most low-resource settings. Diagnosis is currently based on a syndromic method, thereby missing women who are asymptomatic[58,59]. Low-cost, rapid tests are needed to make progress in addressing this problem. Alternatively, women who test positive for gonorrhea could be automatically treated for chlamydia[60].

HIV: Combining STI counseling, testing, and treatment with voluntary counseling and testing for HIV would be a major benefit to the mother and newborn. Treatment of all STIs should include counseling about safe sex behaviors, especially condom use and partner treatment. Specific treatment for the major STIs and also for urinary tract infections is outlined in Table 4.2. If a clinician knows that a woman has gonorrhea, the best practice is to treat this woman for chlamydia as well[60]. More information is available on the CD-ROM.

PANEL 4.9
LESSONS LEARNED

PRENATAL SYPHILIS SCREENING POLICY AND PRACTICE IN MOZAMBIQUE

In sub-Saharan Africa, it is estimated that 4-16 percent of pregnant women have syphilis. Syphilis is the major cause of 26-42 percent of stillbirths in parts of Malawi and Zambia. Basic screening with rapid plasma-reagin (RPR) takes 15-20 minutes and costs about 30 cents (US), and treatment is US$1.00 per dose of benzathine penicillin, given three times. In 1979, universal prenatal syphilis testing was made national policy in Mozambique, yet a study in 1993 found that screening was carried out for only approximately five percent of women.

A program by Health Action International in nine health facilities reinforced RPR testing and supported maternal and child health nurses. Screening coverage increased from 5 percent to 80 percent. However, four months later the testing dropped to 25 percent because of increases in transportation costs, laboratory closures, and RPR shortage. After meeting with the Medical Director for Mancia Province, this was made a program priority. Activities include:

- improving the procurement and distribution of RPR tests and penicillin;
- conducting a five-day intensive workshop for the MCH nurses;
- improving quality such as having the MCH nurses drawing blood (instead of the lab workers), ensuring same day results, and treatment;
- enhancing supervision of the laboratory; and
- education for women to promote coming in for screening and treatment.

As a result of these systems-approach changes, the coverage of RPR testing increased to 80 percent in the health facilities with labs. These facilities identified about 6,500 pregnant women who tested positive for syphilis, out of a total population of about 60,000 (WRA). Unfortunately, information was not available on what proportion of women who were RPR-positive were actually treated or what the impact was on fetal-neonatal outcomes. Future challenges include maintaining supplies of RPR, penicillin, and syringes, overcoming difficulties with monitoring, and determining how to include partner treatment.

Source: Adapted from Ramirez[63].

TABLE 4.2
INVESTIGATION AND TREATMENT OF INFECTIONS IN PREGNANCY

INFECTION	MATERNAL SYMPTOMS	INVESTIGATION	TREATMENT
Syphilis *(Treponema pallidum)*	***Primary*** Ulcer or chancre at site of infection. ***Secondary*** Rash, mucocutaneous lesions, adenopathy. ***Tertiary*** Cardiac, neurological, auditory, eye, or gummatous lesions.	***'Screening tests'*** • Rapid plasma reagin (RPR) • Venereal disease research laboratory (VDRL) There are many causes of false-positive and false-negative tests for syphilis, including being pregnant. ***Specific treponemal test*** i.e., fluorescent treponemal antibody test, which is more sensitive, but more expensive. ***Newer tests – in field trials by* PATH**[a] Immunochromatic instant testing strip with 96% sensitivity and almost 100% specificity, cost projected to be "low".	***For the mother*** 1.2 **million units** of procaine penicillin G **IM** daily for 10 days **OR** 2.4 **million units** of benzathine penicillin IM single dose ***For the neonate*** Procaine penicillin G, 50,000 units/kg single daily dose for 10 days (should be given even if the mother has been treated unless her RPR or VDRL has been shown to decrease four-fold following treatment)
Gonorrhea *(Neisseria gonorrhoeae)*	Infections are usually asymptomatic in women. May be vaginal discharge or, later, symptoms of pelvic inflammatory disease.	High vaginal swab for culture and sensitivity – unavailable and complex to perform. Hence usually based on 'syndromic diagnosis'. ***Newer tests – under development by* PATH**[a] Immunochromatic instant testing strip, cost projected to be "low".	One IM dose of ceftriaxone, 125 mg ***For the neonate*** Eye prophylaxis oxytetracycline ointment or 1% silver nitrate unidose Treatment for ophthalmitis Ceftriazone, 25 - 50 mg/kg IM in single dose (max dose 125 mg)
Chlamydia *(Chlamydia trachomatis)*	Infections are usually asymptomatic in women. May be vaginal discharge or later may be symptoms of pelvic inflammatory disease.	High vaginal swab for culture and sensitivity, but it is difficult to culture chlamydia. In industrialized settings often use urine antigen test (expensive). ***Newer tests – under development by* PATH**[a] Immunochromatic instant testing strip, cost projected to be "low".	Erythromycin orally 500 mg four times daily for 7 days **OR** Amoxycillin orally 500 mg three times daily for 7 days ***For the neonate with ophthalmitis/ALRI***[b] Erythromycin 50 mg/kg/day in 4 divided doses daily for 10 - 14 days.
Urinary tract infection or asymptomatic bacteriuria	May be frequent or pain on urination, or fever and loin pain if pyelonephritis develops.	Urine 'dipstick' for nitrites/leukocyte esterase. Urine microscopy and/or culture and sensitivity. Recommended at 16 weeks of pregnancy.	Choice of drug depends on local sensitivity patterns. Duration may be a single dose or daily doses for 4 - 7 days. Single treatment has similar cure rate and fewer side effects.
HIV	Depends on stage of disease. Often no symptoms or signs.	Serological testing and/or polymerase chain reaction testing.	Supportive treatment Strategies to reduce MTCT/HIV (see essential newborn care intervention sub-package).
Genital herpes simplex virus	Vesicles on the cervix if active (risk of herpes encephalitis in baby).	Microscopy of vesicle fluid, not available in most settings.	Acyclovir for the mother and cesarean delivery if lesions are active.
Hepatitis B virus	Asymptomatic or history of jaundice.	Hepatitis B serology.	Prevention of mother-to-child transmission of Hepatitis B through immunization of both mother and newborn

Sources: MMWR[60], Walker[61], Carroli et al.[62]

[a]PATH: Program for Appropriate Technologies for Health, based in Seattle. MTCT/HIV: Mother to Child Transmission. [b]ALRI: acute lower respiratory infection.

B. CARE DURING PREGNANCY INTERVENTION PACKAGE

B5. Package Component: Promotion of Birth Planning

Birth planning is the process of assisting women and their families in adopting and maintaining healthy behaviors. The birth planning approach is directed at pregnant women, their families and key community decision-makers. The content of the birth planning messages must be simple and memorable. The information needs to be presented through a media that is easily understood such as songs, dramas, or puppet shows. Table 4B.5 outlines the key information that can be included in a birth plan.

TABLE 4B.5

CARE DURING PREGNANCY INTERVENTION PACKAGE

PACKAGE COMPONENT – *BIRTH PLANNING*

- ✔ Educate women and their communities about danger signs for the mother and newborn (Figure 4.2).
- ✔ Enable women to choose skilled providers and to use clean materials for delivery.
- ✔ Encourage mothers, fathers, and families to prepare for potential complications during delivery or in the newborn (i.e., to know where to go and how to get there).
- ✔ Help mothers and families prepare for care of the newborn, especially promoting early exclusive breastfeeding and the "clean chain" and the "warm chain" (see essential newborn care intervention sub-package).
- ✔ Enable HIV positive mothers to plan options to reduce the risk of transmission to newborns, including explaining the balance of risks for feeding babies and opportunities for antiretroviral therapy, if appropriate.

Panle 4.10 describes how birth planning can be an important intervention, in combination with others, to improve health outcomes.

PANEL 4.10
LESSONS LEARNED

IMPROVING MATERNAL SURVIVAL IN BANGLADESH

Bangladesh has made significant progress in reducing child mortality, but maternal mortality remains very high (440/100,000 live births in 1990); an estimated 28,000 women die annually. Fetal and neonatal mortality are also very high, with a neonatal mortality rate of almost 50 per 1,000 live births.

From 1998-2001, the Government of Bangladesh, CARE, and UNICEF implemented the Dinajpur Safe Mother Initiative. Activities included:

- assisting couples to develop a birth plan which included information on danger signs, how to access services, and ways to facilitate mobilization of resources for services;
- developing behavioral change communication strategies to raise awareness about and create demand for maternal health services, including emergency obstetric care;
- establishing community support systems that increase utilization of appropriate services when needed, including transportation, communication, and funds for medical services;
- strengthening the ability of government health service providers to enhance their capacity to provide high-quality emergency obstetric care services; and
- strengthening the linkages between the community and the health personnel through stakeholder committees.

After three years the results of this project showed an increase in the met need of obstetric care services from 17 percent to 39 percent. Other achievements included an increase in the knowledge of dangers signs among women and key decision makers. Government health workers, community health workers, schoolteachers, and community leaders were all key stakeholders involved in the process. Through the committees, communities felt that they were able to make a valuable contribution to addressing this problem. Families are more aware of the risks of pregnancy and the role of family planning in women's health. Communities now recognize the potential impact of a maternal death and know how to avoid this. The program is now incorporating focus on newborn survival.

Source: CARE[15].

C. Care During Delivery Intervention Package

The care during delivery period is critical for mother and baby because many deaths (or initiation of the cause of later deaths) occur then. Improved care during labor and delivery could potentially reduce maternal mortality by 50 to 80 percent and perinatal mortality by 30 to 40 percent[16].

CARE DURING DELIVERY INTERVENTION PACKAGE

OVERALL VISION

For every woman in labor to have a skilled birth attendant and to have, if required, access to quality emergency obstetric care for herself and basic resuscitation for her newborn. If the birth is normal, the woman should not be subjected to unnecessary medicalization of the delivery.

Aims of key interventions during delivery.

1. Skilled Attendant at Birth

- ☐ Monitor labor with a partograph.
- ☐ Ensure a clean delivery.
- ☐ Provide early recognition and action for danger signs for mother and newborn, including facilitating access to emergency data base care, if required.
- ☐ Carry out basic newborn resuscitation, if required.
- ☐ Provide family-centered care.

2. Emergency Obstetric Care

- ☐ Provide early recognition of danger signs.
- ☐ Facilitate timely access to emergency obstetric care services.
- ☐ Provide quality services.
- ☐ Use standard protocols.
- ☐ Train and supervise skilled staff who can perform cesarean delivery.
- ☐ Sustain supply of drugs and equipment.
- ☐ Sustain safe blood bank supply.

The Care During Delivery Intervention Package has two package compenents, which will be further discussed below, including:

C1. Package component: Skilled attendant at birth
C2. Package component: Emergency obstetric care

C. CARE DURING DELIVERYINTERVENTION PACKAGE

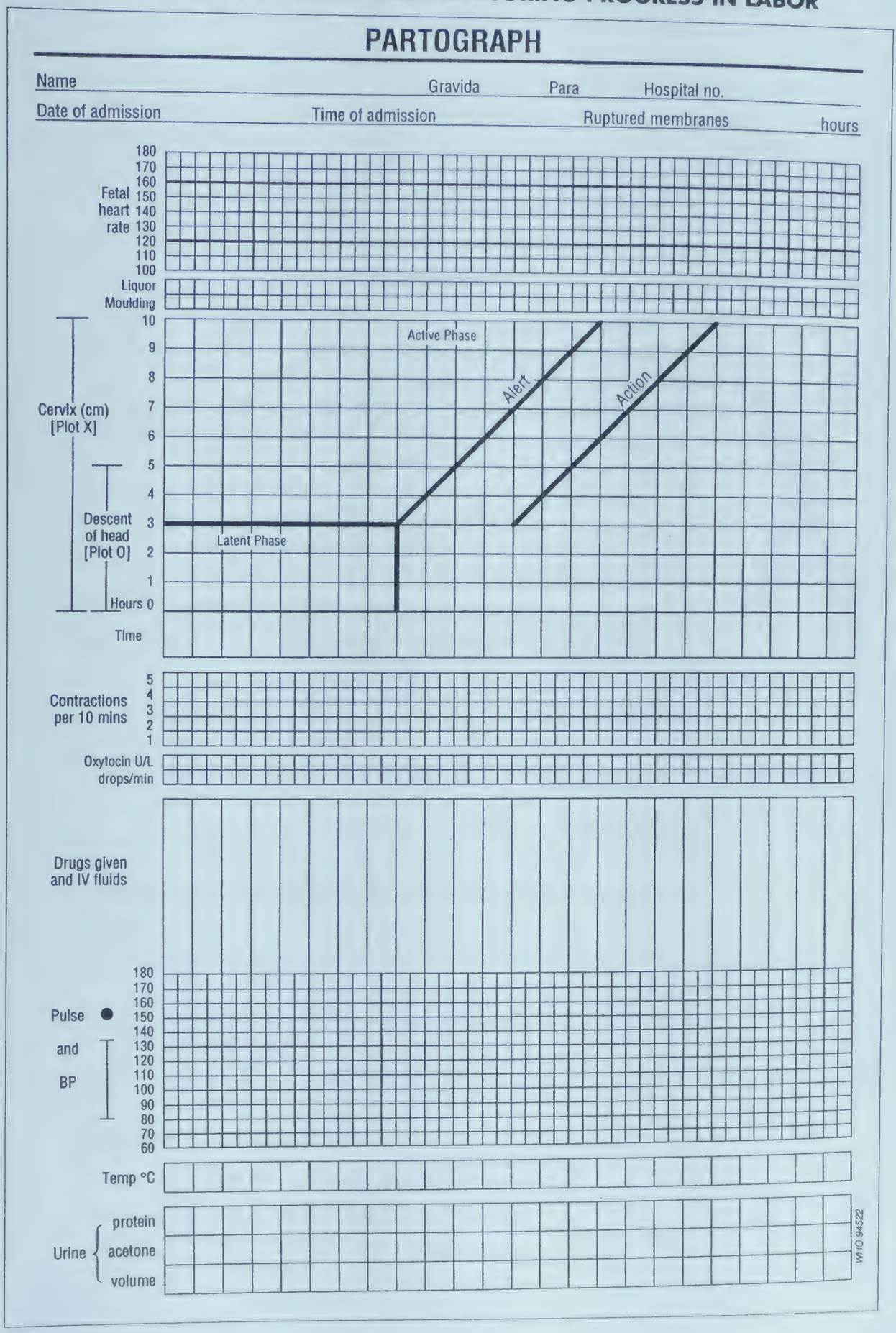
C1. Package Component: Skilled attendant at birth

The single most important intervention for the mother and the baby is skilled attendance at delivery. A skilled provider can manage neonatal asphyxia, sepsis, and tetanus as well as maternal postpartum hemorrhage, sepsis, and obstructed labor. As early as 1955, WHO's expert committee on midwifery training was discussing a program to "result in the evolution from the use of traditional birth attendants and auxiliary attendants to a fully qualified midwife." Half a century later, it is finally becoming a priority in the major WHO initiative "Making Pregnancy Safer," which aims to "massively increase" the proportion of deliveries with a skilled attendant.

Currently only about half of the world's deliveries occur with a skilled birth attendant, and the reality is that there will still be women, especially in rural areas of low income countries, who deliver without a skilled birth attendant for many years to come. Each country and district must develop policies to maximize the coverage of skilled birth attendants and prioritize care for those who clearly are more likely to need emergency care. It is important for the informal and formal health sectors to identify realistic skills and roles for traditional birth attendants so that the formal health sector does not have unreasonable expectations of the informal sector and can help to supervise and monitor birth outcomes. Traditional birth attendants can have an important role in providing culturally appropriate health education and emotional support to women during pregnancy and childbirth and in offering a first link with the formal health care system[4].

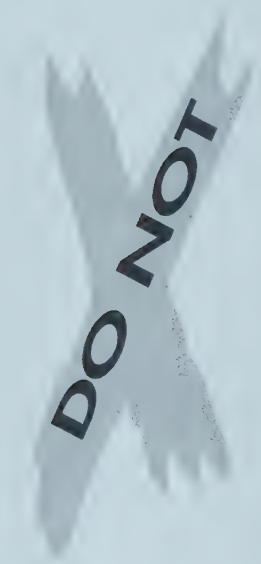
The primary role of the skilled birth attendant is to monitor and manage normal labor and delivery, identify problems in a timely manner, and respond to problems and, if necessary, refer the mother or newborn to a higher level of care. The realization of the importance of normal delivery has led to two new sets of guidelines for what should be done for the normal delivery[35,64]. The partograph is a key tool for early recognition of complications in labor[65]. The partograph is a record of the progression of labor and delivery documenting cervical dilation, and fetal heart rate with time and alerting the attendant to slow, or abnormal progress (Figure 4.4). This record provides a standard for how often the attendant should measure which parameter and what is abnormal as well as a guideline for how to respond. This process is detailed in WHO's Managing Complications in Pregnancy and Childbirth on the CD-ROM.

FIGURE 4.4
THE WHO PARTOGRAPH FOR MONITORING PROGRESS IN LABOR



The presence of a trained supportive companion (sometimes called a doula) at delivery in addition to a skilled birth attendant has been shown to reduce the rate of instrumental delivery and to improve the mother's perceptions of the experience of labor[66]. A randomized study in Botswana found that the presence of a female relative during labor also improved outcomes[67], and this may be more feasible in low-resource settings than providing a doula in addition to a skilled birth attendant. In Botswana, the presence of a female relative was also closer to tradition and improved women's satisfaction with hospital delivery. These findings emphasize that if a doula is not present at delivery, the skill of the attendant is not the only important factor. The attendant's attitude to the laboring women is also important in influencing outcomes[68].

Many unhelpful practices in common use during labor should be discontinued[69,70]. Some examples include:



- shaving pubic hair;
- giving an enema to empty the bowels;
- electronic fetal monitoring;
- giving medication (oxytoxics) to speed up labor without close medical supervision;
- not letting the woman eat or drink;
- repeated vaginal examination;
- getting the woman to lie on her back during labor/delivery;
- routine episiotomy;
- taking the baby away from the mother at birth; and
- unnecessary cesarean section operations.

TABLE 4C.1

CARE DURING DELIVERY INTERVENTION PACKAGE

PACKAGE COMPONENT – *SKILLED ATTENDANT*

Definition

Skilled birth attendants are "people with midwifery skills (i.e., doctors, midwives, and nurses) who have been trained to proficiency in the skills to manage normal deliveries, diagnose and manage or refer complicated cases." The skilled attendant may practice at any level of care--- in the home, health center, or hospital.

Specific tasks of the skilled attendant

- ✔ Monitoring the well-being of the mother and baby during labor by using:
  - woman-centered approach, providing encouragement;
  - partograph to record progress and identify problems early; and
  - fetal stethoscope to monitor fetal heart rate and detect fetal distress.
- ✔ Managing the normal delivery:
  - encouragement, support;
  - clean delivery;
  - drying and wrapping the newborn;
  - active management of the third stage of labor;
  - immediate administration of oxytocin (10 units IM within 1 minute of delivery of the baby);
  - controlled traction of cord (clamp the cord, apply counter-pressure to the uterus, and when the uterus contracts, pull very gently downward on the cord. Never pull without applying counter-pressure above the pubic bone with the other hand). MCPC[7] for more details; and
  - uterine massage.
- ✔ Managing complications for mother and immediate complications for the newborn:
  - early identification of complications and quick response or referral; and
  - ability to resuscitate the newborn.

Increasing coverage of deliveries with skilled attendants

WHO and partners have set a goal of coverage that includes:

- ✔ training more skilled attendants, using pre-service and in-service training that is competency-based;
- ✔ providing supervision and ongoing in-service training to maintain skills and update with new practices; and
- ✔ instituting specific programs targeting populations with low coverage, i.e., rural or certain ethnic groups.

Increasing quality of care

- ✔ Standards for care, staff coverage, and supplies.
- ✔ Skilled staff, with competency maintained.
- ✔ Sustainable supplies.
- ✔ Safe blood supply.

Source: WHO[2], WHO/RHR/00.[77], WHO[64], Hodnett[66].

Women, households, communities, and caregivers must be able to recognize key danger signs in labor (Table 4.3) and must have a plan to access emergency care. Skilled attendants should be able to identify potential complications early, using tools such as the partograph. In many settings, the staff's lack of competence in recognition of danger signs results in delays that can cost the lives of mothers and newborns. Facilities with regular audits of deaths and life-threatening illnesses will be able to assess this potential problem.

TABLE 4.3
DANGER SIGNS IN PREGNANCY

What are the danger signs in labor?

- ✔ Heavy bleeding (more than 500 mL or a pad soaked every 5 minutes or less).
- ✔ Fever more than 38°C (more than100.4°F).
- ✔ Convulsions.
- ✔ Labor lasting more than 12 hours.
- ✔ Placenta not delivered within 30 minutes.

See Figure 4.2



Who should know the danger signs?

- ✔ Individual women.
- ✔ Households, especially decision-makers such as husbands and mothers-in-law.
- ✔ Other community members, especially proxy decision-makers if the husband is away (i.e., village elders).
- ✔ Caregivers in the informal sector (i.e., TBAs).
- ✔ Attendants at delivery.

Source: WHO/RHR/00.7.[7]

C. CARE DURING DELIVERYINTERVENTION PACKAGE

C2. Package Component: Emergency obstetric care

Comprehensive emergency obstetric care (CEmOC) is the management of complications in pregnancy, during delivery, or in the postpartum period. This includes surgical obstetrics (cesarean-sections, treatment of lacerations, laparotomy), anesthesia, medical treatment of shock, eclampsia and anemia, blood replacement, manual procedures, and assisted delivery. However, because many obstetric emergencies occur far from institutions where comprehensive care is available, there is a need for obstetric first aid in the community and for basic emergency obstetric care (BEmOC) to stabilize the woman at a peripheral center (Table 4.4).

TABLE 4.4
EMERGENCY OBSTETRIC CARE STANDARDS

LEVEL OF CARE	STAFFING	TASKS	RECOMMENDED RATIO
Obstetric first aid in the community.	Village health workers. TBAs. Families.	Uterine massage. Oral rehydration salts. Possibly oxytoxics and antibiotics, depending on capacity and policy.	Recommended for all communities.
Basic emergency obstetric care (i.e., health center).	Midwives. Paramedics. Possibly physicians.	Vacuum extraction. Manual removal of placenta. Antibiotics, oxytoxics, magnesium sulfate, and IV fluids as indicated.	Four facilities for 500,000 people.
Comprehensive emergency obstetric care.	Physicians. Midwives. Paramedics.	Some basic emergency care. Cesarean section. Assisted removal of retained placenta. Safe blood transfusion.	One facility for 500,000 people.

Source: Fuerstein, 1993[71].

TABLE 4C.2

CARE DURING PREGNANCY INTERVENTION PACKAGE

PACKAGE COMPONENT – *EMERGENCY OBSTETRIC CARE*

Definition

Obstetric emergencies are life-threatening to mother and/or baby and occur in about 15 percent of deliveries.

Specific tasks for emergency obstetric care (EmOC)

- ✔ Rapid assessment and stabilization of the woman with complications (life-saving skills).
- ✔ Capacity to perform safe cesarean-sections.
- ✔ Capacity to manage major maternal complications:
  - bleeding;
  - infection;
  - obstructed labor;
  - pre-eclampsia/eclampsia; and
  - preterm labor.
- ✔ Ability to manage initial neonatal emergencies, particularly neonatal resuscitation.

Increasing coverage of EmOC

- ✔ Provide a minimum of one comprehensive EmOC facility and four basic EmOC facilities for 500,000 people (Table 4.4).
- ✔ Provide services 24 hours a day.

Increasing quality of EmOC

- ✔ Maintain standards for care (for staff coverage and for supplies) that are known by all involved.
- ✔ Train staff to competency level and foster team work with clearly defined roles.
- ✔ Ensure adequate levels of supplies and functional equipment.
- ✔ Sustain safe blood supply.
- ✔ Practice emergency drills to assess and reinforce roles and skills.
- ✔ Monitor quality and reward staff who promote better quality of services.

Best Reading: WHO/RHR/00.7[7].

One specific complication that greatly affects neonatal mortality is preterm labor. Preterm birth is a major factor in at least 20 percent of neonatal deaths globally. Even in industrialized settings, preterm labor is often of unknown cause and is very difficult to halt[72]. Table 4.5 provides some suggestions on how to manage this condition. However, there are several simple and inexpensive policies that, if implemented, could dramatically reduce mortality of preterm babies. These include:

- giving intramuscular steroid injections to women in preterm labor, a treatment that would reduce respiratory distress due to surfactant deficiency and neonatal mortality by about 50 percent [73,74]; and
- giving antibiotics if there is spontaneous rupture of the membranes before 37 weeks of gestation[75], which has been shown to reduce infections in the neonate especially respiratory tract infections.

More infomation about management of preterm labor is available on the CD-ROM.

TABLE 4.5
MANAGEMENT OF PRETERM LABOR

Definition

Preterm labor is labor that starts before 37 completed weeks of pregnancy.

Identification of preterm labor

- ✔ Relies on the woman knowing her last menstrual period accurately or antenatal records estimating gestation.
- ✔ Requires woman and attendants to recognize the importance of additional interventions for preterm labor and to refer or implement intervention.

Specific tasks

- ✔ If associated rupture of membranes, give antibiotics (injection ampicillin and gentamicin).
- ✔ Give dexamethasone six mg IM four doses six hours apart, or betamethasone 12 mg IM two doses 12 hours apart. Do not give steroids if there is obvious infection.
- ✔ If the cervix is dilated less than three cm and there is no amnionitis, pre-eclampsia, or active bleeding, attempt to stop labor by:
  - giving a tocolytic drug, such as ritidrine (see MCPC[7]). Unfortunately, no current tocolytic is ideal; and
  - continuing careful monitoring of mother and baby (pulse, blood pressure, uterine contractions, blood/fluid loss, fetal heart rate).
- ✔ If the cervix is dilated more than three cm or there is amnionitis, pre-eclampsia, or bleeding, allow the labor to progress, monitor closely, and prepare to resuscitate and care for the baby.

Source: WHO/RHR/00[77], Crowley[3].

D. Postpartum Care of the Mother Intervention Package

Postpartum care of the mother is essential in reducing maternal deaths. However, it also clearly affects the newborn because the mother's ongoing health and survival are crucial for the baby's. Ideally, the same skilled birth attendant who is responsible for postpartum care of the mother will also be responsible for assessing the progress of the stable newborn during the first week. Integration of postpartum and newborn care in this way benefits both mother and newborn. At each postpartum visit, the primary focus should be assessing the condition of the mother (as well as the newborn) for danger signs, such as bleeding, infection, and breastfeeding problems. It is important to watch for breast engorgement to reduce the risk of developing breast abscesses. For many women who have just delivered, especially for those with their first baby, one of the most valuable inputs of postpartum care is the support and encouragement in basic care for their newborn, especially for exclusive breastfeeding. Because the primary focus of this manual is the newborn, this Intervention Package is only briefly discussed. The Best Reading list on the CD-ROM includes a number of very useful resources on this topic.

POSTPARTUM CARE OF THE MOTHER INTERVENTION PACKAGE

OVERALL VISION

For every woman to have routine postpartum care, timely recognition of danger signs, and access to quality medical care in the event of complications.

Aims of key interventions in the postpartum period.

1. Contact With a Skilled Caregiver

- ☐ Timing of routine care
  - ✔ Monitor mothers/newborns for at least the first 24 hours after delivery.
  - ✔ Schedule visits at 6-12 hours, 6 days and 4-6 weeks depending on local policy.
- ☐ Content of care
  - ✔ Provide support for mother and family, especially for breastfeeding.
  - ✔ Provide early identification of complications and referral.
  - ✔ Give Vitamin A, 200,000 IU, for the mother.
  - ✔ Provide family planning counseling.
  - ✔ Immunize the baby and advise the mother on newborn care.

2. Reduce Delays in Access to Emergency Care

- ☐ Educate women, households, and communities about early recognition of danger signs.
- ☐ Provide timely decision-making for referral.
- ☐ Provide timely transportation.
- ☐ Provide quality care, including:
  - ✔ standard protocols;
  - ✔ skilled staff;
  - ✔ sustainable supplies and equipment; and
  - ✔ safe blood supply.

E. Newborn Care Intervention Package

The overall vision for all newborn care is for babies to have as healthy a start as possible. This means that there needs to be early recognition of danger signs and complications to have timely access to quality medical care for treatment, if complications arise.

A newborn may belong to one of four major categories at birth:

- normal;
- normal but requiring special attention because of a maternal condition (i.e., HIV, syphilis);
- low birth weight but stable, at least initially; and
- experiencing complications.

All newborns require essential newborn care to minimize the risk of illness and to maximize their growth and development. Babies can quickly change from appearing normal to being very sick. Emergency preparedness by the family, community, and heath care system is crucial because sick newborns need to be rapidly assessed, stabilized, and managed with standard emergency care protocols. A LBW baby is more likely to become ill than a normal birth weight baby. LBW babies need extra care for their basic needs and extra attention for the prevention and identification of illness. In India and Bangladesh, where about one-third of babies are LBW, good extra care for these babies could have a large effect on newborn survival.

The Newborn Care Intervention Package is divided into three Intervention Sub-Packages, which will be further discussed below.

- E1. Essential Newborn Care for all Babies Intervention Sub-Package.
- E2. Extra Newborn Care for LBW Babies Intervention Sub-Package.
- E3. Emergency Newborn Care for Sick Babies Intervention Sub-Package.

Each of these Intervention Sub-Packages is outlined in the same manner as the previous Intervention Packages. Each Intervention Sub-Package will have sub-package components, which will be discussed further as well as field examples. The Intervention Sub-Packages fall naturally along three themes. Most of the prevention services are included in the Essential Newborn Intervention Sub-Package. The majority of curative services fall under the Emergency Newborn Sub-Package. Many of the activities in the Extra Newborn Care Intervention Sub-Package are similar to those in the Essential Newborn Care Intervention Sub-Package, but they include a different emphasis and implementaiton, in view of the special needs of the LBW.

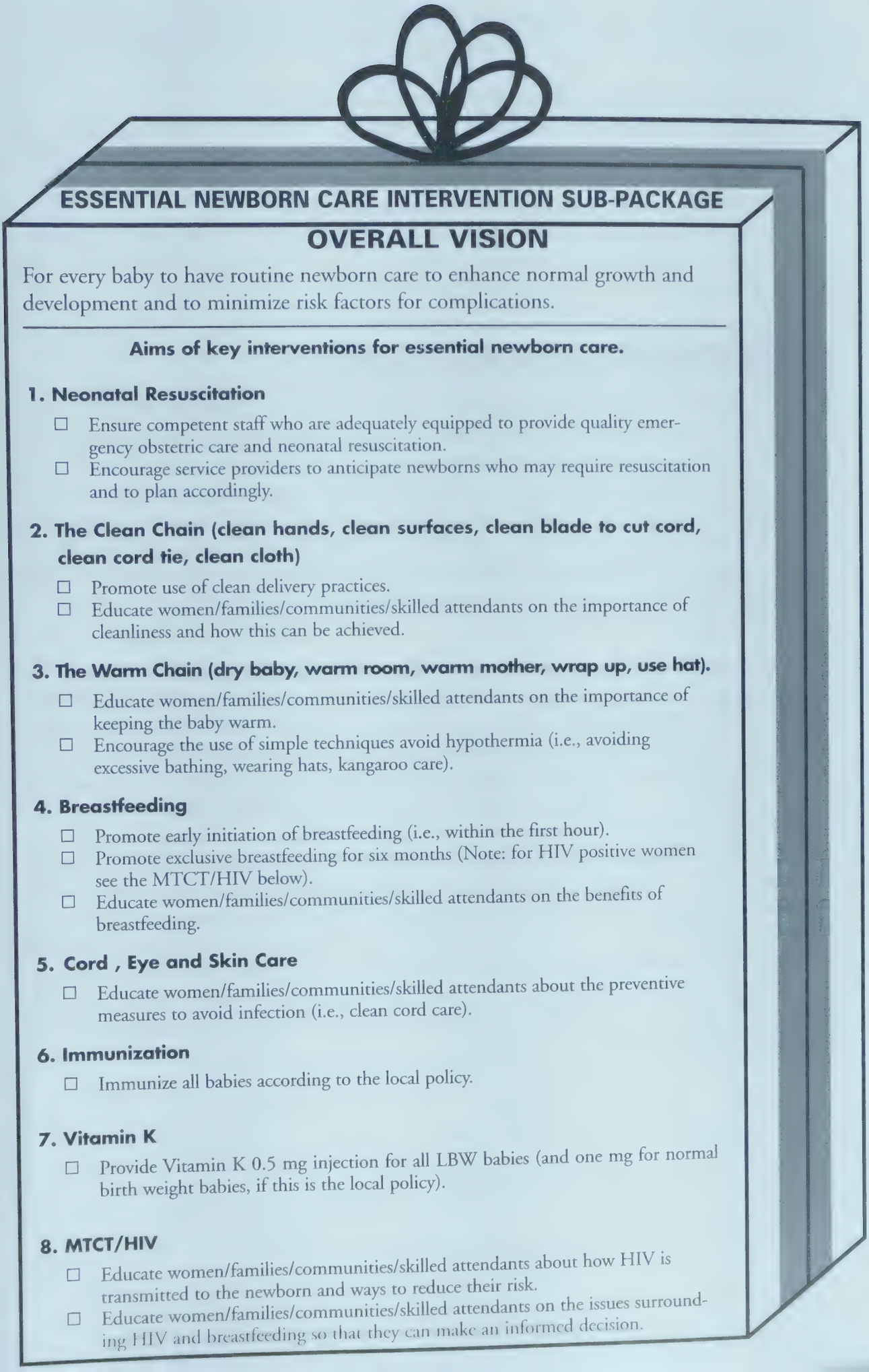
ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1. Essential Newborn Care

Basic needs for any newborn include breathing, warmth, cleanliness, feeding, and love[78]. Clearly, good essential care of the newborn will prevent many newborn emergencies. For example, the umbilical cord may be the most common source of neonatal sepsis and also of tetanus infection, and good cord care could dramatically reduce the risks of these serious conditions. Breastfeeding has a significant protective effect against infections. Early breastfeeding with the baby held close to the mother reduces the risk of hypothermia, as well as hypoglycemia and jaundice.

Each of the eight aims listed for the Essential Newborn Care Intervention Sub-Package will be further discussed in the following sections.

In any setting, many traditions are associated with the care of newborns. Harmful practices can be perpetuated in hospitals as well as in the community. Part Three outlines approaches to assess local practices and categorize them as good practices to be promoted, harmful ones to be altered, and harmless ones to be ignored.



ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

OVERALL VISION

For every baby to have routine newborn care to enhance normal growth and development and to minimize risk factors for complications.

Aims of key interventions for essential newborn care.

1. Neonatal Resuscitation

- ☐ Ensure competent staff who are adequately equipped to provide quality emergency obstetric care and neonatal resuscitation.
- ☐ Encourage service providers to anticipate newborns who may require resuscitation and to plan accordingly.

2. The Clean Chain (clean hands, clean surfaces, clean blade to cut cord, clean cord tie, clean cloth)

- ☐ Promote use of clean delivery practices.
- ☐ Educate women/families/communities/skilled attendants on the importance of cleanliness and how this can be achieved.

3. The Warm Chain (dry baby, warm room, warm mother, wrap up, use hat).

- ☐ Educate women/families/communities/skilled attendants on the importance of keeping the baby warm.
- ☐ Encourage the use of simple techniques avoid hypothermia (i.e., avoiding excessive bathing, wearing hats, kangaroo care).

4. Breastfeeding

- ☐ Promote early initiation of breastfeeding (i.e., within the first hour).
- ☐ Promote exclusive breastfeeding for six months (Note: for HIV positive women see the MTCT/HIV below).
- ☐ Educate women/families/communities/skilled attendants on the benefits of breastfeeding.

5. Cord , Eye and Skin Care

- ☐ Educate women/families/communities/skilled attendants about the preventive measures to avoid infection (i.e., clean cord care).

6. Immunization

- ☐ Immunize all babies according to the local policy.

7. Vitamin K

- ☐ Provide Vitamin K 0.5 mg injection for all LBW babies (and one mg for normal birth weight babies, if this is the local policy).

8. MTCT/HIV

- ☐ Educate women/families/communities/skilled attendants about how HIV is transmitted to the newborn and ways to reduce their risk.
- ☐ Educate women/families/communities/skilled attendants on the issues surrounding HIV and breastfeeding so that they can make an informed decision.

The Essential Newborn Care Intervention Sub-Package has eight sub-package components, discussed below.

E.1.1 Sub-Package component: Neonatal resuscitation.
E1.2. Sub-Package component: Clean chain.
E.1.3 Sub-Package component: Warm chain.
E.1.4 Sub-Package component: Breastfeeding.
E.1.5 Sub-Package component: Cord, eye, and skin.
E.1.6 Sub-Package component: Immunization.
E.1.7 Sub-Package component: Vitamin K.
E.1.8 Sub-Package component: MCTC/HIV.

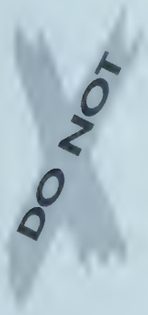
ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.1 Sub-Package Component: Neonatal resuscitation

WHO estimates that approximately one to five percent of babies will require resuscitation at birth[79]. This means that up to 6 million babies per year require resuscitation. Of these six million, about 1 million will die and an unknown number will have long-term disabilities. Many of these babies could be saved with very basic resuscitation. An international study found that 80 percent of babies requiring resuscitation needed only a bag and mask (ambul bag) and room air[80]. This means that oxygen and more complex procedures, such as endotracheal intubation, are not necessary to save most of these newborns. The basics of neonatal resuscitation are outlined in Table 4E.1.1.

The main barriers to effective resuscitation are lack of competent staff and lack of simple equipment. If competency in neonatal resuscitation is listed as a required skill for skilled attendants, the outlook for the asphyxiated infant will improve considerably. Competency-based training for neonatal resuscitation requires the use of a baby "dummy" with bags that inflate to show the resuscitator that they are inflating the lungs. The most common error in resuscitation is underinflation of the lungs. Correct placement of the mask and the placement of the baby's neck are important. Watching the chest of the baby to ensure that it is moving is crucial. If the inflating bag has a blow-off valve at 30 cm of water, it is very unlikely that the baby's lungs will be damaged. These inflating bags are available for about US $6 but could be cheaper if mass-produced. WHO has also developed a device whereby the practitioner can blow into a tube attached to a mask without a valve to inflate the lungs. The practitioner is to be taught to blow at the right pressure by practicing with a sphygmomanometer (blood pressure machine). However, because the user is likely to be alone and also to be taking care of the mother, simultaneously evaluating the correct rate (around 40 respirations per minute) and pressure for ventilation may be unrealistic.

There are many practices associated with neonatal resuscitation that are not based on evidence and may be harmful. Some newborn resuscitation practices that should be discouraged include[82]:



- slapping, blowing on, or pouring cold water on the baby;
- holding the baby upside down;
- routine suctioning of the mouth and nose of a well baby;
- heavy suctioning of the back of the throat of any baby; and
- giving injections of respiratory stimulants or routine sodium bicarbonate injections.

The introduction of a standardized resuscitation protocol in a province in China reduced harmful practices, strengthened good practices, and dramatically reduced neonatal deaths (Panel 4.9)[81]. About two-thirds of babies requiring resuscitation can be predicted before delivery as a result of obvious problems, such as preterm birth, detected fetal distress, multiple pregnancy, etc. In these cases, the attendant should try to identify a partner who can take care of the mother, while the person who is most competent in neonatal resuscitation takes care of the baby. While the goal is to have skilled attendants at all deliveries, the reality is that it will take time before this occurs in certain parts of the world. In the meantime, there needs to be pragmatic ways to save the lives of mothers and babies. Many babies with asphyxia are born at home with a TBA[83]. In India, TBAs were trained to carry out resuscitation. Panel 4.11 summarizes a Chinese experience on improving neonatal resuscitation practices while Panel 4.12 shares lessons learned from a community based program in India.

Care after resuscitation is also vital for the newborn. A baby that has been successfully resuscitated will require close observation for at least the first 12 hours. This baby is at greater risk of developing hypoglycemia, and if the brain was hypoxic for a significant period, the baby may start convulsing a few hours after birth. Care of the asphyxiated newborn is discussed under the Emergency Newborn Care Intervention Sub-Package (Table 4E3.5). If the baby could not be resuscitated, the mother will need careful counseling.

Table 4E1.1 outlines the equipment and appropriate procedures needed to resuscitate a newborn, more detail about equipment for the newborn is provided in the Appendix.

PANEL 4.11
LESSONS LEARNED

RESUSCITATION PROTOCOL REDUCES NEONATAL MORTALITY BY TWO-THIRDS IN A CHINESE PROVINCE

Neonatal asphyxia is the leading cause of neonatal mortality in China, and as neonatal mortality accounts for 60 percent of infant deaths, this is the key issue to meet national goals of reducing IMR by one-third. However, "traditional" resuscitation is still widely practiced, including wiping the baby's body with alcohol as well as adminstrtaing injections, such as Vitamin C, 50 percent glucose, sodium bicarbonate, and dexamethasone.

A program in Zhuhai City, close to Macau, instituted standardized neonatal resuscitation program guidelines based on the American Academy of Pediatrics guidelines (1990). The guidelines specified oro-pharyngeal suction, followed by ventilation with bag-and-mask or endotracheal tube. Cardiac compression was performed for babies with a heart rate below 60 beats per minute after effective ventilation. Injections were rarely to be used and restricted to sodium bicarbonate or adrenaline for specified situations. Training materials were developed and certification provided for those who were trained.

Over a two-year period, the early neonatal mortality rate (deaths in the first week) dropped from 9.9 per 1,000 live births to 3.4 per 1,000 live births. Of the 21 babies with severe asphyxia (defined as an APGAR score of less than three), only one infant was found to have cerebral palsy. Hence, by changing to a standard resuscitation policy, the early neonatal mortality rate was reduced by two-thirds, still with a low rate of long-term disability.

Source: Zhu et al[81].

TABLE 4E1.1

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *NEONATAL RESUSCITATION*

Identification of babies to resuscitate

- Not breathing at birth.
- Blue color of mouth and body, or floppy and white.

Be Prepared!

Standards and staff:	Develop resuscitation standards for different levels at your setting. Use existing national or WHO guidelines as a basis. Provide competency-based training for all staff who will be at deliveries. Provide supervision and on-going training, as these skills can be lost.
Supplies and equipment:	Dry clean cloth. Bag and mask (ambu bag). Suction apparatus (a range of options are detailed in the WHO document). Gloves.
Additional equipment:	Shelf to put the baby on. Method to keep the baby warm, such as overhead light bulbs. Oxygen supply.

Immediate actions

- ✔ Dry the baby and cover with a clean cloth.
- ✔ Suction the mouth and nose if required (over-suctioning at the back of the throat can make the baby's condition worse).
- ✔ Place the baby correctly, with a small roll of cloth under the neck to extend it slightly.
- ✔ Place the mask (attached to the bag) firmly over the baby's mouth and nose and form a seal.
- ✔ Squeeze the bag to inflate the lungs at a rate of 40 respirations per minute.
- ✔ Watch the baby's chest carefully to see that the chest is rising and falling as you squeeze the bag.
- ✔ If the baby starts breathing regularly, stop using the ambubag.
- ✔ If there is no gasping or breathing at all, stop resuscitating after 20 minutes.
- ✔ If there was gasping but no spontaneous breathing, stop resuscitation after 30 minutes.
- ✔ Universal precautions should be observed, including hand washing, disinfecting all equipment, and use of gloves, if available.

Actions after baby is stable and breathing

- ✔ Warm the baby if she or he has become cold (see Table 4E1.3).
- ✔ Keep the baby under observation until she or he has been stable for at least 6 hours.
- ✔ Explain what happened to the mother.
- ✔ See box on neonatal asphyxia for information on how to deal with further problems.

Mouth-to-mouth resuscitation

If a bag and mask are not available, mouth-to-mouth resuscitation is effective.
The risk of infection to the resuscitator can be reduced by cleaning blood and mucus from the baby's face and mouth with a cloth and placing a cloth over the baby's mouth and nose before starting to ventilate.
Seal the mouth and nose with your mouth, and blow at a rate of 40 respirations per minute.

Source: WHO/RHT/MSM/98.1[79].

PANEL 4.12
LESSONS LEARNED

COMMUNITY-BASED NEONATAL RESUSCITATION IN INDIA

Birth asphyxia is a major cause of neonatal deaths. Many neonates affected by birth asphyxia are born at home with TBAs. Kumar conducted a study in rural communities in India to evaluate the effect of training on the resuscitation practices of TBAs. From 8 to 100 TBAs attended training sessions on resuscitation techniques in an area near Chandigarh, India. These trainings were performed in response to the Primary Health Center's finding that TBAs relied on traditional methods of resuscitation, such as instillation of onion juice in the nostrils, milching of the umbilical cord, and warming the placenta.

TBAs were trained in several resuscitation techniques, including:

- gravity drainage of secretions and cleaning the mouth with a finger wrapped in gauze;
- physical stimulation by flicking at the soles of the feet;
- mouth-to-mouth resuscitation and cardiac massage;
- prevention of heat loss by wrapping the baby in multiple layers of cloth; and
- some TBAs were later trained to use a mucus extractor and bag-and-mask ventilation.

Results showed that most of the trained TBAs used a combination of traditional and modern resuscitation methods (30 of 45 babies). Thirteen babies were resuscitated with modern methods alone. Only two TBAs exclusively used traditional resuscitation methods. Among 21 cases delivered by the TBAs who had received advanced training, mucus extractors and bag-and-mask were used in 33.3 percent and 42.6 percent of cases, respectively. Adoption of modern resuscitation methods by TBAs who received advanced training, demonstrates that after training they are likely to change their practices. Unfortunately, no data were available on outcomes for the babies or as to whether the asphyxia could have been prevented by improved intrapartum care.

Source: Kumar[84].

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.2 Sub-Package Component: Clean chain

Cleanliness at delivery would be a major step forward in reducing the risk of infection for the mother and baby, especially neonatal sepsis and tetanus. However, "simple" cleanliness is often not simple to achieve[85]. Cleanliness requires mothers, families, and birth attendants to avoid harmful traditional practices, and prepare necessary materials. Hand washing is the single most important behavior to emphasize for both family members and health care workers (Table 4E1.2).

There are six main components to using the clean chain including the following steps. First, the attendant's hands should be washed with soap immediately before delivery, and fingernails should be kept short. In settings with high HIV prevalence, it may be important for the attendant to wear gloves to protect against the risk of transmission. Gloves may be scarce and reuse of gloves may be a source of infection. If gloves do have to be reused, they can be steamed clean as described in MCPC on the CD-ROM. Second, delivery on a clean surface is very important in reducing the risk of tetanus[86,87] and also probably sepsis, although the risk for sepsis has not been shown as clearly as the risks for with tetanus. If the clean surface is a washed cloth or sheet on the mother's abdomen, it can then be used to dry and wrap the baby. Placing the sheet on the mother's abdomen can help to promote breastfeeding and reduce heat loss. Third, cutting the cord with a clean instrument is crucial. A new or freshly boiled blade is an inexpensive, clean cord-cutting implement. Fourth, the cord should be either firmly tied with clean thread or clamped with a cord clamp, if available. Subsequent care of the cord is discussed in "Umbilical Cord Care."

The use of clean delivery kits may facilitate the promotion of cleanliness at birth, especially if there is no skilled attendant (Panel 4.13). Most clean delivery kits include soap, a plastic sheet for delivery, a clean blade, and a cord tie.

TABLE 4E1.2

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *CLEAN CHAIN*

Clean delivery (WHO six cleans)

- ✔ Clean attendant's hands (washed with soap).
- ✔ Clean delivery surface.
- ✔ Clean cord-cutting instrument (i.e., razor blade).
- ✔ Clean string to tie cord.
- ✔ Clean cloth to wrap the baby.
- ✔ Clean cloth to wrap the mother.

(A clean birth kit may help promote clean deliveries).

After delivery

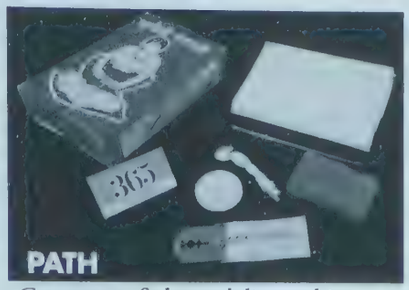
- ✔ All caregivers should wash hands before handling the baby.
- ✔ Feed only breast milk*.
- ✔ Keep the cord clean and dry.
- ✔ Use a clean cloth as a diaper/napkin.
- ✔ Wash baby's bottom and your hands after changing diaper/napkin.

*Note: If the mother is HIV-positive, then alternatives to breastfeeding may be better for the baby, and the family should be counseled before delivery.

Source: WHO[64].

PANEL 4.13
LESSONS LEARNED

SOCIAL MARKETING OF CLEAN DELIVERY KITS IN RURAL NEPAL



Contents of clean delivery kit.

In Nepal, 92 percent of deliveries occur at home, often in unhygienic conditions. A birth is considered polluting, so a traditional birth is conducted as far from the home as possible (for example, in a cowshed or field). The dirtiest implements and materials of least value are used as the surface for delivery, cord cutting, and tying. The concept of Clean Home Delivery Kits was developed in Nepal by PATH, UNICEF, and Save the Children-USA. The purpose of the kit was to encourage clean birth practices to reduce maternal and infant mortality and morbidity. The components in the kit were sealed in a plastic bag and included:

- 1 small piece of soap for hand washing;
- 3 pieces of string for tying the cord;
- 1 new stainless-steel blade for cutting the umbilical cord;
- 1 plastic sheet to serve as the clean delivery surface; and
- pictorial instructions showing how and in which sequence to use the kit components, with an emphasis on hand-washing.

Items that have been included in kits elsewhere include wooden fingernail cleaning sticks, cord-cutting surface (for example, in Nepal, a plastic coin), latex gloves, pieces of gauze for various uses, eyedropper for placing medication (tetracycline) in the baby's eyes, flashlight, and small bowls for washing with hot water.

The kits in Nepal were developed through needs assessment and field trial research. The contents are preassembled by a self-sustaining business run by local women and are made available for sale from small shops, health posts, medical stores, health volunteers, and TBAs. Over the past five years these kits have been advertised through several social-marketing techniques:

- the Ministry of Health promoted the kits in Safe Motherhood campaigns;
- radio spots were broadcast, and advertisements were shown in cinema halls;
- local and international NGOs promoted the kits at the community level;
- posters, flashcards, banners, village billboards, and flyers gave information about the kit;
- street dramas were performed; and
- mobile units with speaker systems promoted the kits at community markets.

An evaluation of clean delivery kits was carried out in three districts in Nepal during 1998. Surprisingly, over 90 percent of those who did not use a kit still used a new or boiled blade to cut the cord, possibly influenced by the social marketing campaign. The use of a clean blade was found to be very effective in reducing infections. Untrained birth attendants who used the kit were much more likely to wash their hands than those not using the kit (91% compared to 76%). Kit users were more likely to use soap among both trained (96% vs 73%) and untrained attendants (84% vs. 46%). Interestingly, less than five percent of mothers left the cord uncovered with nothing on it, even though this was the targeted behavior. Satisfaction with the kits was high, and more than 90 percent of users planned to buy kits again.

Source: Tsu[88], PATH[89], WHO/FSE/MSM/93.10[90].

[a] PATH is currently developing a manual on the use of clean delivery kits, with funding from the Gates Foundation.

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.3 Sub-Package Component: Warm chain

Avoiding hypothermia (rectal temperature less than 36.5°C [96.8°F]) is important for newborn health outcomes because hypothermia increases morbidity and mortality. LBW babies are especially susceptible to becoming cold (Table 4E1.3). All newborns, however, can easily lose heat. The risk of losing heat is greatest when the baby is wet (i.e., just after delivery or being bathed). A baby can lose one degree of body temperature per minute when wet, even in a room that is not obviously cold. To prevent heat loss, it is necessary to dry the baby and wrap him or her in a clean, dry cloth and to make sure the baby's head is covered. This may appear simple but very often is not done[91]. At both home and institutional deliveries, the baby is often left wet and unwrapped while the placenta is delivered. Preventing hypothermia for the newborn has been described as the warm chain, the opposite of the cold chain for vaccine transport. The consequences of changing temperature can be as serious as that of inactivating vaccine efficacy. Preventing hypothermia is a challenge in the community as well as institutions (Panel 4.14).

TABLE 4E1.3

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

PACKAGE COMPONENT – *WARM CHAIN*

At delivery

- ✔ Ensure the delivery room is warm (25° to 28° C), with no drafts.
- ✔ Deliver the baby on a clean surface.
- ✔ Dry the baby immediately.
- ✔ Wrap the baby with clean dry cloth.
- ✔ Keep the baby close to the mother (ideally skin-to-skin) to stimulate early breastfeeding.
- ✔ Postpone bathing for 6 hours*.

After delivery

- ✔ Keep the baby clothed, wrapped with the head covered.
- ✔ Minimize bathing, especially in cool weather or for small babies.
- ✔ Keep the baby close to the mother.
- ✔ Use kangaroo care for stable LBW babies or for rewarming stable bigger babies.
- ✔ Show the family how to avoid hypothermia, how to recognize it, and how to rewarm a cold baby. The family should aim to ensure that the baby's feet are warm.

* In high HIV prevalence areas, early bathing may be a strategy to prevent MTCT/HIV.

Source: WHO/FHE/MSM 97.2[91].

PANEL 4.14
LESSONS LEARNED

KEEPING NEWBORNS WARM IN NEPAL

The normal infant is most sensitive to hypothermia in the first 6 -12 hours after delivery. Hypothermia can easily occur in a newborn who is left exposed and wet. This can happen, if health care workers wait until the placenta is delivered and the cord is cut to dry and wrap the baby. In Nepal, TBAs were trained to take rectal temperatures. They found that 58 percent of newborns born between January and March had a temperature of less than 35°C within 12 hours of birth. TBAs were trained to:

- wrap/warm babies immediately instead of letting them rest on the floor until the cord was cut;
- postpone bathing; and
- keep babies' heads covered.

These types of community initiatives demonstrate the importance of involving local stakeholders in needs assessment activities and the potential for teaching important techniques to TBAs.

Source: Levitt[92].

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.4 Sub-Package Component: Breastfeeding

Breastfeeding provides many advantages for the baby, mother, and society. Despite the well-known advantages (outlined in Part One), early and exclusive breastfeeding requires active support at all levels of care[93].

Support for individual women is crucial. Helping the mother to position the baby correctly to avoid sore nipples and answering her concerns (i.e., inverted nipples or not producing enough milk) can increase a woman's confidence in her ability to provide adequate nutrition to her newborn. First-time mothers and mothers of LBW babies or babies with problems, such as cleft palate or lip or a very small jaw, need additional encouragement and support in breastfeeding. Counselors trained in breastfeeding support have been shown to be highly effective at increasing the proportion of babies who are fed early and who are exclusively breastfed. Support is more effective if the counselor visits the new mother at home[94]. More details on good positioning are available on the CD-ROM.

Policy support is also required at the institutional level and can include closing "well-baby wards," practicing "rooming in," and taking other steps to make hospitals "baby-friendly" (Panel 4.15). At the community level, the mother can be supported to rest at home by providing more help with her work/childcare while she is lactating. Keeping the baby with the mother in the first hours and days of life not only promotes breastfeeding but reduces infections and hypothermia. National and international policy support is also effective through maternity leave policies and enforcement of the international marketing code, which limits advertising practices of breast milk substitutes.

Table 4E1.4. provides an outline of the key components of breastfeeding.

TABLE 4E1.4

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *BREASTFEEDING*

Early breastfeeding = breastfeeding within the first hour, with counseling for correct positioning.

- ✔ Early breastfeeding reduces the risk of postpartum hemorrhage for the mother.
- ✔ Colostrum (the "first milk") has many benefits for the baby, especially anti-infective properties.
- ✔ Lying on the mother while feeding helps the baby stay warm.
- ✔ The full milk supply will start more quickly and more milk will be produced in the long-term.

Exclusive breastfeeding = breast milk alone for the first 6 months of the baby's life.

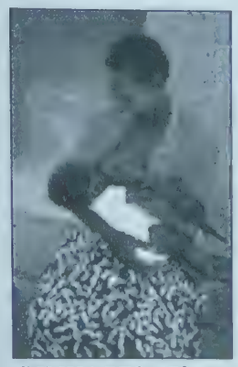
- ✔ Breastfeeding delays the mother's return to fertility because of lactational amenorrhoea.
- ✔ Breastfeeding provides the best possible nutrition for the baby.
- ✔ Unless extremely malnourished, virtually all mothers can produce enough milk.
- ✔ Feed day and night, at least 8 times in 24 hours, allowing on-demand suckling by the baby.
- ✔ If the baby is small (less than 2,500 grams), wake to feed every 3 hours.
- ✔ If the baby is not feeding well, seek help.
- ✔ Successful breastfeeding requires support for the mother, the family, and health institutions.
- ✔ There is no need for extra bottle feeds or water for normal babies, even in hot climates.
- ✔ Exposing the baby to water increases the likelihood of infections, especially diarrhea.
- ✔ Water reduces the effectiveness of breast milk in preventing infections and providing nutrition.

Note: If the mother has HIV, alternatives to breastfeeding may be better for the baby, and the family should be counseled and make an informed choice BEFORE delivery.

Source: LINKAGES[95], WHO/UNICEF/UNAIDS[96].

PANEL 4.15
LESSONS LEARNED

BEING FRIENDLY TO BABIES


LINKAGES- Ghana

The widespread adoption of exclusive breastfeeding has the potential to save the lives of more than 1.5 million infants each year. Since its launch by UNICEF and WHO in 1991, the Baby-Friendly Hospital Initiative (BFHI) has harnessed the support of other international organizations, health workers, breastfeeding advocates, policy makers, and mothers in both developing and developed countries. To be certified as "baby-friendly," a maternity institution/hospital must adhere to the Ten Steps to Successful Breastfeeding presented below.

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers to initiate breastfeeding within a half-hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation even if they should be separated from their infants.
6. Give newborn infants no food or drink unless medically indicated.
7. Practice rooming-in (allow mothers and infants to remain together, 24 hours a day).
8. Encourage breastfeeding on demand.
9. Give no artificial teats (feeding bottles) or pacifiers (also called dummies or soothers) to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

As of June 1999, a total of 14,637 facilities had been designated as "baby-friendly" – 1,788 in Africa; 1,172 in Latin America/Caribbean; 10,428 in Asia; 780 in the Middle East; 230 in Eastern Europe; and 239 in other industrialized countries.

This progress has been achieved through effective partnerships at all levels (governmental, community, institutional, and individual). This initiative has improved both mother and child health and breastfeeding.


LINKAGES- Ghana

Source: The Baby-Friendly Hospital Initiative[97].

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.5 Sub-Package Component: Cord, Eye, and Skin Care

Umbilical cord care: As part of the clean chain, the cord should be cut with a clean implement and tied firmly with a clean tie. WHO's policy is not to leave the stump uncovered; no bandages or [86]. In many societies, however, this is a major change in behavior. Depending on local practices, it may be more feasible to encourage the use of an antiseptic alternative, such as Dettol or chlorhexidine, both of which have been shown to reduce colonization of the cord. Further study is required to evaluate the effect of these agents on prevention of neonatal sepsis and tetanus and the feasibility of their use in behavioral change. Delayed cutting of the cord until pulsation reduces anemia in the newborn, especially if preterm. However, the reduction in maternal postpartum hemorrhage with active management of the third stage has led to a clear policy of early clamping[7,98] (Table 4E1.5A).

TABLE 4E1.5a

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *CORD CARE*

DO

- ✔ Cut the cord with a clean instrument (i.e., razor blade).
- ✔ Tie the cord tightly with clean thread or use a cord clamp.
- ✔ Keep the cord clean and dry and wash hands before touching it.
- ✔ Fold napkin or diaper below the cord stump.
- ✔ Apply chlorhexidine or an iodine compound, which may be beneficial in some settings, especially if it is an alternative to harmful local practices.
- ✔ Use topical antimicrobials only if the baby is in the hospital away from the mother and is at risk of infection with hospital organisms.

DON'T

- ✔ Bandages are unnecessary and may delay healing and introduce infection.
- ✔ Alcohol cleansing may delay healing.
- ✔ Applying traditional remedies to the cord may cause infections and tetanus.

WATCH OUT FOR

- ✔ Pus discharge from the cord stump.
- ✔ Redness around the cord especially if there is swelling.
- ✔ High temperature (more than 38° C) or other signs of infection.

Source: WHO/RHT/MSM/98.4[86].

Skin care: The skin of a newborn is vulnerable to infections, especially if the baby is preterm. Skin infections are more likely to result in serious infections, such as sepsis, in a newborn than in an older child. Vernix, the white greasy covering on a term baby's skin, is protective against infections and also against hypothermia. Simple principles to reduce the risk of skin infections are presented below:

- leave vernix on the skin; do not rub vernix off vigorously as this can damage the skin;
- change diapers soon after they are wet or dirty;
- ensure that caregivers wash their hands before handling the baby; and
- evaluate the local practices for skin care to decide if certain oils are helpful or harmful.

There is limited information on the use of oils on newborns' skin. Certain barrier creams may be helpful in strengthening the skin as a barrier to infection, especially for preterm babies. Some local oils, particularly mustard oil, may be harmful and damage the skin and increase the risk of infections. More evidence is needed before recommendations can be made on this subject.

Eye care: Ophthalmia neonatorum is defined as any conjunctivitis with discharge occurring during the first two weeks of life. The infection may become systemic or may result in permanent eye damage if treatment is delayed or inappropriate. The most common causes are gonococcus and chlamydia trachomatis, but these organisms cannot be distinguished on clinical examination alone, although gonococcal ophthalmitis tends to be more severe.

Gonococcal ophthalmitis can be prevented by cleaning the eyes immediately after birth and applying either silver nitrate solution (1%), tetracycline solution (1%) or erythromycin (0.5%) ointment. Silver nitrate is 93 percent effective against gonococcus, but there is a risk of chemical conjunctivitis, especially if the silver nitrate has been stored in a large container. This risk can be avoided by using single-dose or small containers and avoiding prolonged storage. Tetracycline ointment is 97 percent effective against gonococcus and also may be effective against some strains of chlamydia. Silver nitrate is not effective against chlamydia. Tetracycline and erythromycin are preferable to silver nitrate as their effectiveness is broader and their cost is similar to the unidose silver nitrate, without the risk of chemical conjunctivitis. When prophylaxis fails, it is most often because it was administered too late (after the first hour). Eye prophylaxis is a simple, highly cost-effective intervention, costing US $1.40 per case averted when the rate of gonococcal infection is greater than ten percent[99]. Despite the proven efficacy of this preventive measure, it has not been widely implemented (Table 4E1.5b).

If an infant develops ophthalmitis, early identification and treatment is important. Treatment involves injection ceftriaxone, 25-50 mg/kg IM in a single dose (maximum 125 mg). In addition, the eye needs to be cleaned and tetracyline (1%) should be applied or erythromycin (0.5 percent) ointment every four hours (for one to two days) until the pus has cleared.

TABLE 4E1.5b

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *EYE CARE*

DO

- ✔ Clean eyes immediately after birth (provided the baby is stable).
- ✔ Give prophylactic eye drops (tetracyline ointment 1%). This precaution costs US $1.40 per case of ophthalmitis averted (if more than ten percent of women have gonococcal infection).
- ✔ Administer drops within 1 hour of birth.

DON'T

- ✔ Put anything else in the baby's eyes.

WATCH OUT FOR

- ✔ Discharge from the eyes, especially with redness and swelling around the eyes.
- ✔ Other signs of severe infection, such as fever (greater than 38°C [100.4°F]) and poor feeding.

Source:WHO/ FRH/MSM/96.13[100].

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.6 SUB-PACKAGE COMPONENT: IMMUNIZATIONS

Immunizations should be given according to the national immunization schedule. In most developing countries, BCG and oral polio are given at birth. In South Asia, hepatitis B immunization is usually given at birth. In sub-Saharan Africa, hepatitis B immunization is given first at six weeks of age along with the first diphtheria, pertussis, and tetanus immunization and the second oral polio dose. It is important to give immunizations to LBW and preterm babies according to their age and not by gestation or by weight. Sometimes clinicians delay immunizations for LBW babies. There is no evidence to support this delay, and it puts the baby at additional risk.

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.7 SUB-PACKAGE COMPONENT: VITAMIN K PROPHYLAXIS

An injection of 1 mg of Vitamin K given to the newborn immediately after birth prevents bleeding due to Vitamin K deficiency and should be given to all LBW and sick neonates[101]. Injection Vitamin K is cost-effective for all newborns to prevent hemorrhagic disease of the newborn. It costs US $52 per disability-adjusted life-year averted in areas of high incidence (more than 72 per 100,000 births)[102]. Oral Vitamin K is widely used in Europe and is considerably less expensive. However, data on incidence from developing countries is lacking, and in many settings, although hemorrhagic disease of the newborn is severe, other conditions have a higher priority for intervention. A global recommendation to give Vitamin K to all neonates has not been made by WHO, although the vitamin is given in most industrialized and many transitional countries.

ESSENTIAL NEWBORN CARE INTERVENTION SUB-PACKAGE

E1.8 Sub-Package Component: Preventing Mother-to-Child Transmission of HIV

In settings where HIV prevalence is high (more than 5%), locally appropriate policies should be developed and applied in order to reduce mother-to-child transmission (MTCT/HIV). The goal is HIV-free child survival, and not merely avoiding HIV infection while increasing the risk of dying due to another cause[21]. Many factors will have to be examined, including attitudes towards HIV-positive individuals and available financing for MTCT/HIV programs. All stakeholders need to be involved in discussions to assess the feasibility and acceptability of potential polices. The cost of voluntary testing and counseling for HIV in antenatal clinics if HIV prevalence is more than five percent is estimated at US $35 per disability-adjusted life-year averted, which is comparable to US $20 to US $40 per disability- adjusted life-year averted by polio and diphtheria-pertussis-tetanus immunization[103].

Indirect effects of new policies in the general population should also be considered. Examples include more violence against women who are identified as HIV-positive or increased child diarrhea deaths due reduced breastfeeding by HIV-negative as well as HIV-positive women[104,105].

Interventions to reduce MTCT/HIV require two key actions.

Action 1: Women need to know their HIV status.
The goal is for women who consent to be tested during pregnancy to have access to full counseling. To achieve this, the following must be in place:

- Women attend an antenatal clinic.
- Women are willing to be tested for HIV.
- Trained counselors are available to allow women to be fully informed about the test, their result, and the consequences.
- Laboratory facilities are in place and reliable supplies of testing kits are available at low cost or free.
- There is a benefit to learning HIV status, such as an available intervention to MTCT/HIV.

In many settings with high HIV prevalence, this is far from the current reality for most women.

Action 2: Women must have real choices for action if they are HIV-positive.
The decision to test is based on the balance of benefits and barriers for the woman and for her baby. This balance will vary by setting and for individual women. In many settings where the stigma of HIV is high, the cost of diagnosis may be social rejection, and this is too high for most women. The M needs to be kept in MTCT programs[104,105]. Some of the benefits and costs affecting the decisional balance for women are outlined in Table 4.6.

TABLE 4.6
BENEFITS OF AND BARRIERS TO HIV TESTING OF PREGNANT WOMEN

	BENEFITS	BARRIERS
Mother	• Mother is able to make informed choices and plan for future. • Antiretroviral treatment is unlikely to be routinely available for most women, but other supportive care (e.g., Septrin prophylaxis, TB prophylaxis) may be available.	• Mother risks rejection by family/society and possibly violence. • The fear of facing inevitable death. • Mothers choosing not to breastfeed may result in stigmatization.
Baby	• MTCT/HIV could be reduced from 25-35% to less than 10% depending on the availability of antiretroviral drugs and the feasibility of breastfeeding replacements[21].	• If mother decides not to breastfeed, there is an increased risk of infant morbidity and mortality from infection and malnutrition. • If mother gives mixed feeding (some breast-feeding, some breast milk substitutes), there is probably a higher risk of HIV transmission[106].

There are three main areas for interventions to reduce the risk of MTCT/HIV which are discussed below.:

- **Policies during labor and delivery:** Approximately 30 percent of babies who are infected with HIV from their mother are believed to be infected at delivery. Observing simple policies during delivery may reduce vertical transmission of HIV[107].

  - Avoid artificial rupture of membranes, if possible. The longer the membranes are ruptured before delivery the greater the rate of MTCT/HIV. The rate of transmission increases by two percent each hour after the membranes have been ruptured for 4 hours[108].
  - If possible, avoid an instrumental delivery (i.e., forceps) or the use of invasive procedures on the baby (i.e., scalp monitors). Avoid unnecessary episiotomies[109].
  - Giving the mother a vaginal douche with an antiseptic (such as chlorhexidine) reduces MTCT/HIV if the membranes have been ruptured for more than four hours.
  - Cesarean section combined with Zidovudine® reduces the risk of transmission to about two percent[109], but the procedure carries significant risk, especially in low-resource settings, and therefore cannot be recommended as a routine practice[110].

- **Antiretroviral therapy:** There are numerous options of drugs, doses, and timing. Zidovudine® (antepartum/intrapartum/neonatal), Zidovudine® and Lamivudine® (3TC) (intrapartum/neonatal), and nevirapine (intrapartum/neonatal) have all been shown to be effective in randomized controlled trials. The question is how to translate this into policy for low-resource settings and how to put policy into practice[21]. The most feasible and cost-effective drug in low-resource settings may be Nevirapine, with one dose given to the mother during labor and one dose for the baby at 48-72 hours of age[107]. A detailed discussion of the current recommendations is beyond the scope of this manual. The CD-ROM contains further information and also links to websites with updated information.

- **Policies for infant feeding:** The decision to use replacement feeding is extremely complicated due to three reasons. First, the risk of not breast-feeding in many low-resource settings may result in more infant deaths due to infections than would have occurred due to HIV transmission. Second, the cost of replacement feeding may be excessive. For example, in Kenya the cost of six months of artificial milk may be 150 percent of the average annual wage[111]. Third, the social unacceptability of not breastfeeding is a barrier for many families. Even in a randomized controlled trial where women were carefully selected and counseled and all milk and medical care were supplied, at least 70 percent of those randomized to give artificial milk alone also gave breast milk[111]. Women who plan to use replacement feeding may end up giving mixed breast and artificial milk, which may in fact put the baby at higher risk of MTCT/HIV and also at higher risk of infections and malnutrition[106].

  There are three main options for feeding practices among women who are HIV positive or who have an unknown status. These options all presented below.

  - *Replacement Feeding:* if replacement feeding is to do more good than harm, there must be availability of artificial milk at low cost or free, as well as safe water, a way to boil the water, and a way to sterilize bottles. The reality is that these prerequisites are lacking for many of the areas with high HIV prevalence.

  - *Exclusive Breastfeeding:* if the mother is breastfeeding, good technique for feeding is as important as mastitis. Cracked, bleeding nipples increase the risk of transmission of HIV. An option being debated is whether HIV-positive women who choose to breastfeed in settings where there is little alternative could be supplied with an antiretroviral drug (Panel 4.16)[21].

- *Breastfeeding with early rapid weaning.* Weaning at four to six months of breast milk and onto solids is another option, but data are still lacking on the reduction of MTCT/HIV by this strategy.

The considerations vary according to the setting, but also according to the individual woman. Skilled counseling and ongoing support of HIV-positive mothers is crucial. Other options for a few women include using an HIV-negative wet-nurse to feed the baby or expressing milk and heat-treating it to kill the virus.

PANEL 4.16
LESSONS LEARNED

PREVENTING MOTHER-TO-CHILD TRANSMISSION OF HIV IN SUB-SAHARAN AFRICA

In 1999, approximately 600,000 infants were infected as a result of mother-to-child transmission, mostly in sub-Saharan Africa. The increasing number of HIV-infected children places an enormous burden on families and the health care system. Through operations research, Horizons, a program implemented by the Population Council, seeks to identify cost-effective approaches to providing MTCT/HIV prevention services that meet the needs of women and their families.

UNICEF and UNAIDS, in conjunction with the governments of Zambia and Kenya, are supporting Horizons' research related to MTCT/HIV. This research examines several interventions:

- access to voluntary counseling and testing for all mothers; access to antiretroviral drugs for HIV-positive mothers; and
- access to breast milk substitutes for HIV-positive mothers.

This project found that several operational challenges accompanied the introduction of MTCT/HIV prevention services:

- identifying the best counseling approach and maintaining confidentiality;
- improving care during pregnancy for all women in the context of the MTCT/HIV prevention initiative; and
- including outreach activities and seeking community involvement and support.

Horizons has developed a training curriculum that addresses the roles of clinics and communities in preventing MTCT/HIV. Nearly 200 staff at three pilot sites in Kenya have received training using this curriculum. Participants report that the realization that they can do something to prevent MTCT/HIV has motivated them to offer care during pregnancy and counseling on HIV/AIDS.

Source: Population Council/Horizons. September 2000. "Prevention of Mother-to-Child Transmission of HIV."

PANEL 4.17
LESSONS LEARNED

BREASTFEEDING AND HIV IN NDOLA, ZAMBIA

In Zambia, one of every five persons between the ages of 15 and 49 years is infected with HIV, one of the highest HIV prevalences in the world. Approximately 25,000 Zambian infants are infected each year, either in utero, during delivery, or through breastfeeding. However, most Zambians do not know their HIV status.

The Ndola Demonstration Project is part of national efforts to address MTCT/HIV. The project is designed to enable women to make an informed choice to optimally feed their infants in the context of high HIV prevalence and to carry out that choice.

The following are key findings from the project's research all presented below.

- Breastfeeding is the norm, but exclusive breastfeeding is not common.
- Women who do not breastfeed may be stigmatized as promiscuous and/or having HIV.
- Community members and health workers tend to overestimate the rate of transmission of HIV through breastfeeding.
- Household food insecurity is widespread, and infant feeding options are limited because of economic concerns; replacement feeding with infant formula or modified cow's milk costs 4 months of the average wage.

The project has integrated improved counseling on infant feeding practices and maternal nutrition as well as providing HIV voluntary counseling and testing by existing community health services. Since this is a new project, there are no available evaluations yet.

Source: Linkages[112].

E2 Extra Newborn Care for the LBW Baby

LBW babies are at much greater risk of dying than are normal-weight babies. A LBW baby born at term has about a 3-fold greater chance of dying than one with normal birth weight. However, a preterm baby has a 9- to 10-fold higher death rate depending on how premature the baby is.

Yet many babies weighing 1.75 to 2.5 kg (the majority of LBW babies) could be saved with simple interventions. In settings such as Bangladesh and India, where the LBW rate is about 30 percent and the majority of deaths are LBW babies, a little extra care of these babies could dramatically reduce neonatal mortality rates. In sub-Saharan Africa, where LBW rates are lower (usually about 15% or less) and a bigger proportion of LBW may be due to preterm birth, the effect of extra care for LBW babies may be less dramatic. However, other vulnerable groups of babies may benefit from the same philosophy of extra care, particularly babies of multiple pregnancies (twins, triplets) or babies with birth defects, such as cleft palate.

EXTRA NEWBORN CARE FOR THE LBW BABY INTERVENTION SUB-PACKAGE

OVERALL VISION

For every baby to have routine newborn care to enhance normal growth and development and to minimize risk factors for complications.

Aims of key interventions for extra newborn care for the LBW baby.

1. Identification of the LBW Baby

- ☐ Identify LBW newborns using locally appropriate methods.
- ☐ Educate women/families/communities/skilled attendants on the special needs of a LBW baby and how they can address them.

2. Extra Clinical Care of the LBW Baby

- ☐ Promote breastfeeding and warmth of the well LBW baby.
- ☐ Educate women/families/communities/ skilled attendants on danger signs for the LBW baby.
- ☐ Provide quality care and simple appropriate technology for the care of the ill LBW baby.

3. Extra Support for Feeding

- ☐ Promote breastfeeding and warmth of the well LBW baby; including express breast milk.
- ☐ Provide support for women/families to care for the ill LBW baby.
- ☐ Educate women/families/communities/skilled providers on the newborn danger signs.

4. Extra Support for Warmth

- ☐ Educate women/families/communities/skilled providers about the importance of keeping the baby warm.
- ☐ Educate women/families/communities/service providers to use simple methods to ensure that the baby stays warm, such as kangaroo care.

5. Vitamin K

- ☐ Provide Vitamin K 0.5mg injection for all LBW babies.

The Extra Newborn Care Intervention Sub-Package has five sub-package components, which will be further discussed below:

E2.1. Sub-Package component: Identification of the LBW baby.
E2.2. Sub-Package component: Extra clinical care of the LBW baby.
E2.3. Sub-Package component: Extra support for feeding.
E2.4. Sub-Package component: Extra support for warmth.
E2.5. Sub-Package component: Vitamin K prophylaxis.

E.2 EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

E2.1 Sub-Package Component: Identification of LBW babies

To target LBW babies for extra care, they must first be identified. However, it should be stressed that it is not necessary to weigh all babies with digital scales. For the purposes of targeting those babies most likely to need extra care, a simple alternative assessment, such as foot size or chest circumference with a color-coded tape, is all that is required (Figure 4.5). As more deliveries occur with a skilled attendant, recording of birth weight will become the norm. Ideally, each baby should be weighed and have the birth weight recorded.

In a study of 843 babies in Addis Ababa, Ethiopia, researchers attempted to identify a practical screening tool to identify LBW neonates. Gestational age, birth weight, and four body measurements (chest, head, and mid-arm circumference and length) were accurately recorded. The group used a simple predictive algorithm. Infants were classified as high risk if the head circumference was less than 31 cm or if chest circumference was less than 30 cm; otherwise they were classified as low risk. This algorithm has over ninety percent sensitivity and specificity for prediction of preterm and LBW births. This study shows that neonatal body measurements can be combined into a pragmatic, accurate screening tool[113].

Figure 4.5 describes alternatives that can be used to identify BLW babies.

FIGURE 4.5
ALTERNATIVE METHODS FOR IDENTIFYING LBW BABIES



FOOT SIZE

One community-based program in India taught village health workers to refer all babies whose foot length was less than 6.5 cm to the subcenter and to make frequent follow-up visits for newborns if foot size was 6.5–7.0 cm to supervise feeding and thermoprotection[114].

CHEST, MID-ARM OR HEAD CIRCUMFERENCE

Chest circumference has been used as a simple, accurate surrogate for birth size, but there is no agreed international cut-off point. A study in Ethiopia found that a chest circumference of less than 30 cm sensitively predicted LBW. The same study found that a head circumference of less than 31 cm was a good predictor[113]. Sensitivity and specificity are improved by combining measurement of chest circumference with either mid-arm circumference (less than 8.7 cm used in India) or with head circumference (less than 33 cm used in Brazil)[115]. The Brazilian study covered 5,000 newborns and identified 92.8 percent of LBW preterm babies and 76.5 percent of neonatal deaths[116].

SPRING BALANCE

A simple spring balance developed by TALC (Teaching Aids at Low Cost, London) can be hung from a tree or held by hand with the baby in a cloth sling. The scale can be color-coded for illiterate users. It is accurate to within +0.02 kg in the range 1.6–4.8 kg[117]. A simpler spring-based device is available from PATH (BIRTH weigh IITM) that indicates if the baby's weight is more than 2.5 kg, but it is not useful for monitoring on-going weight gain.



BALANCE SCALES

Most hospitals and many health centers are equipped with balance scales, and while these are more accurate, they are expensive and require maintenance as well as competency in use.

ASSESSING GESTATIONAL AGE

Ultrasound assessment of gestational age inutero is often considered the gold standard, but it is not available for most of the world's pregnancies. Basing gestational age on the last menstrual period may be more inaccurate in settings where western calendars are not used and also where prolonged lactational amenorrhoea is common. Assessment of gestational age traditionally requires a high level of clinical skill, and the Dubowitz examination score may take two doctors 20 minutes to perform on a stable baby. Simpler scores are available, such as the Parkin score or the simplified Ballard score. The use of breast nodule size alone for assessing gestation has been piloted[118]. These alternative methods are not widely validated as yet.

E.2 EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

E2.2 Sub-Package Component: Extra clinical care for LBW babies

Babies weighing between 1.75 kg and 2.5 kg (corresponding to more than 34 weeks of gestation) have a high probability of survival without major disability and can be managed in a lower-level facility or even at home with careful supervision. Babies weighing less than 1.75 kg are likely to be preterm and are more likely to require skilled care, although not necessarily intensive care. The WHO Essential Care Practice Guidelines recommend that babies weighing less than 1.75 kg at birth should be looked after in an institution with basic equipment for tube feeding and giving oxygen therapy. Whether the baby is cared for at home or in a facility, the mother should be present and actively involved in care, unless she is too ill to do so. Her presence and input are the most important "equipment."

For most of the world's preterm babies, complex management of respiratory distress with ventilation and surfactant therapy is not likely to be available for a long time. Yet many deaths could be prevented by better care of preterm labor and also by better simple care of small babies.

Tables 4E2.2a and 4E2.2b provide information on care for the well LBW baby and the ill LBW baby.

TABLE 4E2.2a

EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – CARE FOR THE WELL LBW BABY (1.5 TO 2.5 KG)

Where?

✔ In a health care facility or at home with extra support.

Do

✔ **Provide breastfeeding support.** A well baby this size may require cup or spoon feeding for the first few days at least to "top-up" after sucking and then learn to suck well. The mother will need support to express breast milk, to learn to cup feed safely, and to learn how to feed well. The baby will need to be woken to feed every three to four hours until she or he weighs more than 2.5 kg. More details on cup or spoon feeding and expressing breast milk are available on the CD-ROM.

✔ **Ensure warmth.** Depending on the climate and season, a warm room and dressing and wrapping the baby, especially with the head covered, may be adequate for thermal control. Kangaroo care or hot cots (wire baskets with light bulbs to warm them) may be necessary for colder settings. Aim to ensure warm feet.

Watch out for

✔ **Danger signs** (Figure 4.2). These may be more subtle in a LBW baby, especially if the baby is preterm and not feeding well or inactive because of prematurity. The mother and other caregivers need to be aware of danger signs and need to know how to respond.

TABLE 4E2.2b

EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – CARE FOR A LBW BABY WHO IS ILL AND ALL VERY LBW BABIES (LESS THAN 1.499 KG)

Where?

✔ In a health care facility with basic equipment and staff with newborn care skills.

Do

✔ **Avoid hypoglycemia.** A stable baby can be tube-fed with expressed breast milk, if necessary, giving less volume more often (for example, dividing the every-3-hour feeding volume into three and giving this amount every hourly). A baby with significant respiratory distress will require IV fluids, administration of which should be supervised very carefully. Even if a micro-dropper drip is available, it is very easy to give too much fluid.

✔ **Prevent hypothermia.** Babes this small, or who are unstable, need to be observed more carefully, and so a "hot cot" or an incubator is the best for them. Incubators, if available, need to be used appropriately and well maintained (see explanation in the focus box about Extra Warmth).

✔ **Identify and treat complications,** such as hypoglycemia, neonatal sepsis, or jaundice?

Watch out for?

✔ **Danger signs** (Figure 4.2). These will be more subtle in a LBW baby, especially if the baby is not feeding well and is inactive because of prematurity. Jaundice damages the brain of a preterm baby or a sick baby at a lower level than for a well term baby.

Panel 4.18 provides examples of how newborn care within an institution can be improved.

PANEL 4.18
LESSONS LEARNED

SIMPLE CARE SAVES SMALL BABIES IN A GHANAIAN HOSPITAL



Although the majority of neonatal deaths occur at home, in urban areas of the developing world, hospitals may have high numbers of neonatal admissions. Mortality rates could often be reduced with simple approaches to improve quality of care. One hospital in Kumasi, Ghana, has approximately 3,000 admissions to neonatal nurseries each year, of which almost 1,000 are LBW, mainly preterm, and are admitted to one room called Prems. The mortality in Prems was higher than in the other nurseries, even though most babies who died within the first 6 hours of admission were not recorded in mortality statistics.

A review of performance indicated that apart from the lack of an ambubag for resuscitation, basic equipment was not the main problem. The room had been fitted with hot cots (wire baskets with light bulbs to warm them). There were a few functional incubators, locally made phototherapy units (fluorescent lights fitted in wooden frames), and an oxygen supply. The main issues identified were the absence of standard protocols for care, and a lack of consistent nursing and medical care. The nursing matron had a policy of moving nurses at least every year, even if they wanted to stay and develop more skills in the care of LBW babies. Junior doctors were only sporadically allocated to Prems, and there was no clear system of supervision. Mothers were banned from entering the ward because of fear of infection, and there was limited support for expressing breast milk. An outbreak of diarrhea on Prems resulted in 19 deaths in one week, and this precipitated a review by the Department of Child Health to see how care could be improved.

Several improvements were implemented.

- Mothers were encouraged to stay in the room next to Prems, and support for expressing milk was provided.
- A simple sterilizer was installed for boiling cups for feeding, and a new ambubag was placed on the ward.
- Standard, written protocols for feeding, thermal control, and management of sepsis, jaundice, and other emergencies were developed, laminated, and displayed on the walls.
- The matron gave permission for nurses to choose to continue working on Prems, and a group of motivated nurses gradually gained skills in resuscitation, cup and nasogastric tubefeeding, and supporting mothers.
- Junior doctors were more consistently allocated to Prems. The resident for the nurseries provided daily support, as did a consultant. Priority was given to early identification and management of sepsis and jaundice.
- At weekly mortality meetings, staff discussed all deaths on Prems after the junior doctor presented each case, and avoidable deaths were identified in a nonjudgmental fashion.

During a 3-year period, mortality dropped from 220 per 1,000 to 160 per 1,000, despite the fact that all babies were now being counted even if they died a few minutes after admission. The nurses took real pride in their care of babies, and one baby weighing 870 grams at birth went home and was doing well at one year of age.

Source: Lawn[119].

E.2 EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

E2.3 Sub-Package Component: Extra support for feeding

Breast milk provides the best nutrition for all babies, including LBW and preterm babies. As discussed under the Essential Newborn Care Intervention Sub-Package, the choice is more complex for women known to be HIV-positive. Babies who are term LBW due to IUGR will often feed very well and may experience a growth spurt if the mother is encouraged to feed on demand. Preterm babies often struggle to breastfeed, and so supporting the mother to express milk and feed is crucial for them to thrive in low-resource settings where infections are a high risk.

As outlined in the section on care of the baby weighing less than 1.5 kg, many of these babies will require tube feeding or intravenous fluids and are better managed in a health institution (Table 4E2.3). With time these babies will transit to sucking at the breast and then cup-feeding to "top-up" volume. For those who are supporting mothers to care for preterm babies, one of the key skills is the ability to encourage the mother as she expresses milk and as the baby learns to suckle. The CD-ROM contains more details.

TABLE 4E2.3

EXTRA NEWBORN CARE INTERVENTION SUB PACKAGE

PACKAGE COMPONENT – *EXTRA SUPPORT FOR FEEDING*

What to feed?

Breast milk is always best, and this is especially true for the LBW baby. The only exception is the mother with HIV. If the mother is expressing milk, she will need special support and encouragement

How to feed?

This depends on the condition and maturity of the baby, as well as the delivery setting. The following provides rough guidelines:

- a well baby weighing more than 1.5 kg can be cup-fed or spoon-fed. Then, they can learn to suckle at the breast unless she or he is sick;
- a baby weighing less than 1.5 kg may need to be tube-fed (use a fine tube size Fr. 5 or 6, check the position by aspirating, and fix well with tape that will not damage the baby's skin) and is more likely to be unwell and need IV fluids; and
- a very preterm baby (less than 32 weeks) will gradually progress from IV to tube-fed to cup-fed to sucking at the breast over a period of days or weeks.

How often to feed?

Feeds are usually given every 3 hours, until the baby weighs more than 2.5 kg. In the first few days of life, the baby may require smaller volumes more frequently (hourly), especially if the baby is very preterm or slightly unwell. If the baby has marked respiratory distress or is very unwell, an IV drip is indicated.

What volume to feed?

There are several guidelines for total (oral plus IV) recommended daily volume of fluid intake for newborns. The most commonly used guidelines are:

Day 1	60 mL/kg total in one day
Day 2	90 mL/kg total in one day
Day 3	120 mL/kg total in one day
Day 4	150 mL/kg total in one day
After day 4	Some babies, especially IUGR babies will tolerate up to 200 mL/kg/day by mouth, but this should be never be given IV.

What to watch out for?

- ✔ The baby becoming unwell while feeding, significant vomiting, or the stomach swelling up. If this happens, stop feeding and set up an IV line.
- ✔ Is the baby gaining weight? Ideally, weigh the baby every two to three days.

More information is available on the CD-ROM, especially about expressing breast milk and cup-feeding.

E.2 EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

E2.4 Sub-Package Component: Extra support for warmth for the LBW babies

LBW babies, especially preterm babies, are much more likely to become hypothermic. The priority should be prevention of hypothermia, as discussed under warm chain in the Essential Newborn Care Intervention Sub-Package. The main "links" are drying the baby at birth and wrapping well, keeping the baby very close to the mother unless either the mother or the baby is very ill, and keeping the room warm (Table 4E2.4). Kangaroo care[120,121] is particularly suited for the stable baby of intermediate birth weight (1.5 to 2.5 kg). The evidence for kangaroo care is discussed in Part One.

Increased awareness of hypothermia could be achieved by using a simple low-cost liquid crystal thermometer. Morley has developed a thermospot (approximately 20 cents US each), which is a 1-cm-diameter sticker with a smiley face to be stuck in the baby's axilla. The thermospot color changes from green to red below the temperature of 35°C and has been shown to have a sensitivity of 83 percent and a specificity of 96 percent. This means that the tool is a positive predictive value of 98 percent for the detection of hypothermia[122]. This device could be used by mothers or by health care workers to reduce the rate of hypothermia among LBW babies.

Warming a hypothermic (temperature less than 36°C) baby can be achieved by various methods. If the baby is stable, kangaroo care is the most efficient method (Panel 4.19). If the baby is unwell, an overhead radiant heater is the best method if available. Hot cots or incubators are alternatives.

E.2 EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

E2.5 Sub-Package Component: Vitamin K prophylaxis

Vitamin K should be given to all LBW babies as they are at increased risk of developing bleeding due to Vitamin K deficiency (hemorrhagic disease of the newborn). The dose is 0.5 mg intramuscular injection (1 mg for babies weighing more than 2.5 kg).

TABLE 4E2.4

EXTRA NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *EXTRA WARMTH*

✔ **Warm room, avoid bathing, dress, cover head, and wrap**
For many LBW babies, simple attention to these principles will avoid hypothermia.

✔ **Kangaroo care**
This is skin-to-skin contact of the baby with the mother. Typically, the baby is tied with cloth to the mother's chest. Kangaroo care has been used extensively and shown to be more effective than incubators for thermoregulation of medically stable LBW babies, usually starting several days after birth with intermediate-sized babies. This technique has not been systematically evaluated for home use and cannot be used for a baby who is unstable and needs to be observed closely.

✔ **Sleeping bags**
These are simple bags made of warm fabric. They have been used by the SEARCH team in India.

✔ **Hot cots**
These small wire baskets, heated by light bulbs, can be a very inexpensive, low-tech, effective method of keeping newborns warm.

✔ **Incubators**
These are very expensive to purchase, often difficult to maintain, and can be major sources of infection. They are best used in settings where correct use and maintenance is feasible.

Source: WHO/FHE/MSM 97.2[91].
Available form Teaching Aids at Low Cost, PO Box 49, St Albans, Herts AL1 5TX UK. Fax: 44 1727 846852.

PANEL 4.19
LESSONS LEARNED

KANGAROO CARE

The use of incubators for care of babies in low-resource settings is problematic for many reasons, including:

- expense of purchase and maintenance;
- unreliability of electricity supplies; and
- increased infection risk because they are difficult to clean and are often shared by several babies.

In the kangaroo care method, a well preterm infant, wearing only a diaper, is placed between the mother's breasts in skin-to-skin contact. Kangaroo care can also be provided by the father or another relative, although this has been less well studied. Many early studies in Colombia in the 1970s and more recent studies all over the world have demonstrated improvements in outcomes and other advantages of kangaroo care, such as higher maternal satisfaction. The improvement in survival for hospitalized LBW infants has been documented to be 20-60 percent in randomized controlled trials. In a randomized control trial of preterm babies weighing less than 1,500 grams in a hospital in Zimbabwe, Dr. Kambarami found that the infants allocated to kangaroo care had better health outcomes than infants placed in a standard incubator setting. For the babies in the kangaroo care group, median weight and hospital discharge weight was higher, frequency of illness and median duration of hospital stay was less, and survival rates were better. It should be noted though that these babies were all several days old and were medically stable.

A longitudinal, randomized, controlled trial conducted at the Isidro Ayora Maternity Hospital in Quito, Ecuador, studied the long-term benefits of kangaroo care. The researchers in this study found that after a 6-month follow-up the kangaroo care group had a significantly lower rate of serious illness (lower respiratory tract disorders, apnea, aspiration, pneumonia, septicemia, and general infections) than did the control group.

Implementation is not as simple as it may appear, partly due to behavioral and cultural barriers among mothers concerned about indecency. Medical staff may also be resistant to shifting away from technological solutions. Home use of kangaroo care has not been well-studied, but this is a potential method to improve home care of the LBW baby.

Source: Child Health Research Project[123].

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3. Emergency care for the sick newborn

While many newborn lives can be saved with simple interventions, there are some newborns that require more institutional services to save their lives. To this point, we have largely discussed prevention of neonatal complications. However, service providers also need to be prepared to deal with sick newborns. The main areas to focus on are infections (i.e., sepsis, tetanus), which may result from or contribute to other conditions that may jeopardize the newborns condition, such as: hyperthermic (fever) or hypothermia; hypoglycemia; and dehydration. Prompt recognition of danger signs/complications and timely treatment is essential to prevent a neonatal death.



EMERGENCY NEWBORN CARE INTERVENTION PACKAGE

OVERALL VISION

To identify illness as fast as possible and to receive quality care.

Aims of key interventions for emergency newborn care for the sick baby.

1. Identification of Neonatal Danger Signs

- ☐ Educate women/families/communities/skilled attendants on the newborn danger signs and the importance of seeking prompt treatment.

2. Quality Emergency Care of the Sick Newborn

- ☐ Build the capacity of health institutions to provide quality services for the sick newborn.

3. Severe Neonatal Infection

- ☐ Educate women/families/communities/skilled attendants on the danger signs of severe and the importance of seeking prompt treatment.
- ☐ Promote preventive practices to avoid severe infection (i.e. treatment of maternal infections, clean delivery, clean cord care).
- ☐ Ensure competent staff are adequately equipped to provide quality services, with prompt recognition, investigation and treatment.

4. Neonatal Tetanus

- ☐ Educate women/families/communities/skilled attendants about the importance of using clean delivery practices, particularly maintaining the clean chain.
- ☐ Promote tetanus toxiod immunization for women of reproductive age
- ☐ Educate women/families/communities/skilled attendants on the danger signs of tetanus and the importance of seeking prompt treatment.

5. Neonatal Asphyxia

- ☐ Ensure staff are adequately equipped and are competent to provide quality emergency obstetric care and neonatal resuscitation if required.
- ☐ Develop and apply standard protocols for the management of asphyxia.
- ☐ Prevent asphyxia byencouraging service providers to anticipate which neonatal might be at risk of asphyxia and plan accordingly.

6. Neonatal Jaundice

- ☐ Educate women/families/communities/skilled attendants about the signs of jaundice and appropriate treatment.
- ☐ Ensure competent staff is adequately equipped to provide identify jaundice and provide appropriate treatment and services.

7. Birth Defects

- ☐ Provide family centered care for babies with birth defects
- ☐ Prevent major defects by:
  - Meeting unmet need for family planning for older women
  - Promoting the use of preconceptual folic acid
  - Providing rubella immunization if this is national policy
  - Increasing information regarding avoiding known toxins

8. Severe Bleeding

- ☐ Identify babies with severe bleeding and manage them appropriately.
- ☐ Prevent severe bleeding by providing Vitamin K 0.5mg injection for all LBW babies (and 1mg for normal birth weight babies if this is the local policy).

The Emergency Newborn Care Intervention Sub-Package has three sub-package components, which will be further discussed below, including:

E3.1. Sub-Package component: Identification of the danger signs;
E3.2. Sub-Package component: Quality newborn care;; and
E3.3. Sub-Package component: Severe neonatal infection.

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.1 Sub-Package Component: Identification of Neonatal Danger Signs

Numerous attempts have been made to develop algorithms for early identification of severe illness in the neonate, but those that have been shown to be sensitive and specific are usually highly complex in terms of the clinical skills and laboratory investigations required [124,125]. Approaches that have worked at the community level involve identification of simple symptoms/signs; such approaches may result in over-treatment of some babies without serious illness. Given the high risks associated with failing to detect severe illness, using simple symptoms/signs seems to be the most feasible approach until a specific algorithm is available.

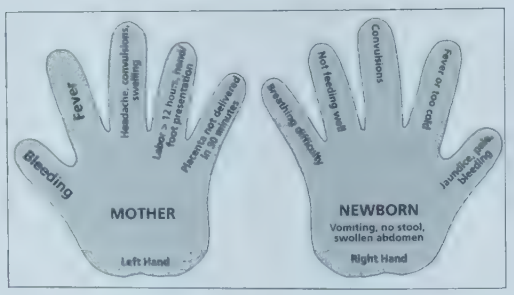
TABLE 4E3.1

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *NEONATAL DANGER SIGNS*

What are the danger signs?

See Figure 4.2



- ✔ Breathing difficulty, irregular, or fast (more than 60 per minute).
- ✔ Not feeding well (less than 50% of usual).
- ✔ Convulsions, spasms, jittery.
- ✔ Fever greater than 38°C or less than 36°C.
- ✔ Jaundice, pale, bleeding.
- ✔ Vomiting green, no stool in first 24 hours of life, very swollen abdomen.

THE PRESENCE OF ONE DANGER SIGN IS A CAUSE FOR CONCERN!

Who should know the danger signs?

- ✔ Individual women.
- ✔ Households, especially decision-makers, such as husbands, mothers-in-law.
- ✔ Community leaders.
- ✔ Care-givers in the informal sector such as TBAs.
- ✔ Attendants at delivery.

Source: WHO/RHR/00.7[7].

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.2 Sub-Package Component: Quality emergency care of the sick baby

Good supportive care (detailed attention to preventing hypoglycemia[126], hypothermia, provision of oxygen if required, etc.) may contribute as much to the reduction of neonatal mortality as specific treatment conditions. While antibiotic therapy is crucial for severe infections, other conditions, such as asphyxia, depend largely on supportive care. Once again, it is important to involve the mother in caring for the baby and to offer family-centered care that takes a welcoming, communicative approach. Motivated nursing care is also invaluable. Some of the principles of quality emergency newborn care are summarized in Table 4E3.2.

TABLE 4E3.2
EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE
SUB-PACKAGE COMPONENT – *QUALITY CARE OF THE SICK BABY*

Identification

Early identification of sickness makes a big difference to the baby's survival. (See Figure 4.2).

Family-centered care

- ✔ Involve the mother actively in care unless she is too ill to do so.
- ✔ Communicate with the mother and family and support them.

Supportive treatment

- ✔ Stabilization, including basic resuscitation with bag and mask if needed.
- ✔ Oxygen therapy, given by nasal cannula if required.
- ✔ Thermal protection – wrap baby well (although still need to be able to maintain close observation).
  - Kangaroo care is probably not good to use for the very sick newborn.
  - Use overhead lights, hot cots, or sleeping bags (see Warm Chain).
  - Use an incubator, if available.
- ✔ Correct/prevent hypoglycemia – measure blood glucose (i.e., using blood sugar stick for diabetics).
  - If blood sugar is less than two mmol/L, correct with a bolus of 10 percent dextrose 20 mL/kg and set a 10 percent dextrose drip to avoid rebound hypoglycemia.
  - If the blood glucose level is greater than two mmol/L but the baby is very ill, set an IV line to prevent hypoglycemia. If the baby is stable, support the mother to breast-feed or to express milk and feed. Chart how much milk should be given and when, and record how much is actually given.

Specific treatment

- ✔ Standards - it is very important to set locally-agreed, feasible guidelines for management of important conditions, including severe infection, neonatal asphyxia, severe jaundice, and bleeding.
- ✔ Standards and guidelines need to be visible, i.e., laminated and displayed on walls.
- ✔ Skills - attendants at birth and other providers need to be competent in applying these guidelines.
- ✔ Supplies and equipment – basic drugs, equipment, and other supplies should be available consistently.
- ✔ Investigations improve the accuracy of specific treatment considerably, especially:
  - blood sugar level;
  - hemoglobin level or packed cell volume (see CD-ROM for PATH/WHO guidelines);
  - bilirubin – accurate management of jaundice without under- or over-treatment requires a bilirubin level; and
  - blood cultures and cerebral spinal fluid (CSF) culture.

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.3 Sub-Package Component: Severe neonatal infection

Severe infection in neonates is the single largest cause of neonatal deaths globally[127]. Severe infections include neonatal sepsis and meningitis, as well as acute lower respiratory tract infections. In low-resource settings, infections are more common and case-fatality rates are higher both because of delays in access to care and lack of quality care. The priority is prevention, but mortality can be markedly reduced by better identification and management, as shown by the story of SEARCH in rural India[9]. This community-based project reduced neonatal mortality by about 62.2 percent in three years, and 75 percent of the reduction was due to the prevention and management of sepsis in the community (Panel 4.20).

While treatment is possible without investigation, if feasible, blood and central spinal fluid cultures are important to guide management. If most cases are being treated without investigation, it is important to have some tracking, at least at the hospital level, of what the organisms are and how sensitivity to antibiotics is changing so that antibiotic policies can be adjusted with time. Table 4.7 lists the presenting problem, possible organisms, and likely treatment for various infections. These treatments are intended only as a guideline, and national or local policies, as well as local patterns of organisms and sensitivities, need to be taken into account before developing a local policy.

Other more novel approaches may soon be available to prevent severe newborn and young infant infections. Pneumococcal vaccine given to pregnant women has been shown to increase antipneumococcal antibody levels in newborns, but the antibody levels dropped quickly and the effect on pneumococcal infections has yet to be demonstrated[128].

Table 4E3.3 describes the main elemtns that the program managers needs to consider in terms of preention, identification and treatment of neonatal infections.

TABLE 4E3.3

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *SEVERE INFECTION*

Identification of severe infection

- ✣ Fever more than 38°C (LBW babies especially may become hypothermic).
- ✣ Poor feeding (especially after feeding well).
- ✣ Difficulty breathing or irregular breathing.
- ✣ Convulsions, spasms, or being jittery.
- ✣ Redness around the umbilicus with or without pus discharge.

See Figure 4.2



Investigations (if available)

- ✔ Blood sugar level.
- ✔ Hemoglobin level.
- ✔ Blood cultures.
- ✔ Lumbar puncture.

Specific treatment – See Table 4.9 for possible antibiotics to use.

Prevention

- ✔ Treatment of STIs in the mother during pregnancy.
- ✔ Antibiotics for prolonged rupture of membranes (more than 24 hours before delivery).
- ✔ Antibiotic cover for preterm rupture of membranes (rupture before the 37th week of pregnancy).
- ✔ Clean delivery.
- ✔ Good cord care, address local cord care practices that are dangerous.
- ✔ Eye prophylaxis, if local policy.

At present, there is not enough evidence to recommend use of pneumococcal vaccine in pregnancy to reduce severe pneumococcal disease in newborns and infants.

For further information, see the materials by Stoll and Darmstatdt in the Best Reading List.

TABLE 4.7
PRESENTATIONS, POSSIBLE ORGANISMS, AND TREATMENT FOR SEVERE NEONATAL INFECTION

PRESENTING PROBLEM	POSSIBLE DIAGNOSIS	LIKELY ORGANISMS	SUGGESTED ANTIBIOTIC THERAPY[a]
Temperature change (more than 38°C or less than 36°C axilla)	Possible septicemia or other infection	Streptococcus pneumoniae Staphylococcus aureus Escherichia coli Salmonella spp	Injection Ampicillin & gentamicin
Poor feeding (less than 50% of normal) (alone or with one of the other signs)	Possible septicemia or other infection		Injection Ampicillin & gentamicin
Irregular breathing or fast difficult breathing (respiratory rate more than 60 per minute)	Lower respiratory tract infection	S. pneumoniae S. aureus	Injection penicillin & gentamicin
Convulsions or twitching, extreme irritability or lack of activity	Meningitis	S. pneumoniae	Injection penicillin & gentamicin
Very stiff with spasms	Tetanus	Clostridium tetani (often associated with gram-negative sepsis)	Injection penicillin & gentamicin
Skin rashes with pustules and/or umbilical cord discharge, especially with surrounding redness	Localized skin infection which may spread to cause septi-caemia	S.aureus Strepococci	Injection cloxacillin
Eye discharge, especially if the eyelid and surrounding tissues are red Note: It is important to treat the mother and her partner(s) as well as the baby.	Ophthalmitis	Gonococcus Chlamydia S. aureus	Injection ceftriaxoneb 25-50 mg/kg single dose not to exceed 125 mg. Also, wash eyes every 4-6 hours and apply tetracycline 1% ointment.
Neonate of mother with syphilis or neonate with suspected congenital syphilis (rhinitis, skin rash especially pustules on soles/palms, hepatosplenomegaly, jaundice). Note: 50% of cases are asymptomatic.	Possible congenital syphilis	Treponema pallidum	Procaine penicillin G 50,000 units/kg single daily dose for 10 days (should be given even if the mother has been treated unless her RPR or VDRL has been shown to decrease 4-fold).

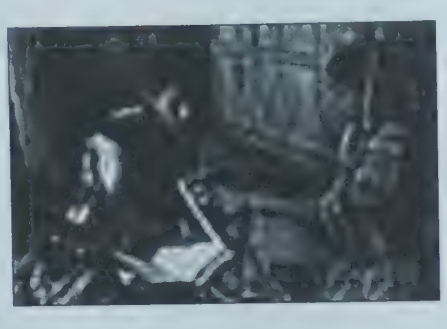
Source: MMWR[60], WHO[124], Stoll[127].

[a] Chosen antibiotic treatment will depend on national or local policies, local information about common organisms and their resistance pattern, and also the specific signs and condition of the ill baby.

[b] Use with caution in babies who have jaundice.

PANEL 4.20
LESSONS LEARNED

HOME-BASED NEWBORN CARE PACKAGE REDUCES NEONATAL MORTALITY BY OVER 60 PERCENT IN RURAL INDIA



Gadchiroli is a poor district in rural Maharastra State, India with a low rate of female literacy (37.9 percent). A community-based organization, SEARCH, found that neonatal mortality was about 60 per 1,000, which is 20 times the rates in Western Europe, and that the LBW rate was 43 percent. The major causes of death included infections, prematurity, and asphyxia. Most of the babies were born at home, and a combination of practical difficulties and traditional beliefs meant that few parents were taking sick newborns to the hospital. Families said that they would prefer newborn care at home from trained community health workers (CHWs).

During a 4-year period, home-based newborn care was introduced in 39 villages; 47 similar villages had no special care, thus allowing comparison later. Traditional care practices in the area were studied carefully before the package was designed. The newborn care package included the following:

1. Preparation and education of mothers during pregnancy, especially training for essential care of their babies with use of a photo album of pictures, flip chart, and discussions.
2. TBAs are trained to reinforce health-promoting beliefs and practices.
3. Village CHWs trained in newborn care, including:
   - resuscitation skills;
   - weighing the newborn at birth using a spring balance, and giving Vitamin K injection;
   - visiting the mother and baby eight times in the first month to assist with breastfeeding and warmth, early detection of illness, and reweighing of the baby;
   - detecting high-risk babies, especially those weighing less than 2 kg, to be visited more often;
   - diagnosing neonatal sepsis using simple clinical criteria and treating with antibiotics at home (injection gentamicin and syrup co-trimoxazole); and
   - managing other neonatal problems, such as breastfeeding difficulties, conjunctivitis, skin or umbilical infections.
4. Visits by a doctor or nurse to each village twice a month to supervise and support the CHWs.

By the third year, 93 percent of newborns in the intervention areas were receiving home-based care. SEARCH was able to record 98 percent of births and child deaths in the area. Neonatal mortality was reduced by 62.2 percent, mostly as a result of fewer deaths from neonatal sepsis. No complications due to the injections were detected, possibly because the CHWs were carefully trained and well supervised. The package was estimated to cost US $5.3 per newborn, and one death was avoided for every 18 babies who received care. The estimated cost-per-life saved was US $95.40, which is less than the cost-per-life saved with measles vaccination.

Source: Bang et al[9].

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.4 Sub-Package Component: Neonatal tetanus

Neonatal tetanus accounts for about 300,000 deaths annually and has one of the highest case-fatality rates of any infection. Approximately 90 percent of babies with neonatal tetanus will die (this represents a case-fatality rate higher than for Ebola virus infection). Even with high technological care, the case-fatality rate is very high. The key lies in prevention, clean deliveries, and good core care, not just with increased coverage with tetanus toxoid. Most neonatal tetanus deaths occur in certain countries and in certain subpopulations. The reasons vary by setting, but generally fall into three major categories:

- low coverage of care during pregnancy or poor quality care during pregnancy resulting in low tetanus toxoid coverage;
- inadequate care during delivery with unhygienic cord-cutting procedures and cord care; and
- poor newborn care, particularly local traditional cord care practices or circumcision practices.

Achieving high tetanus toxoid coverage for pregnant women is more complex than immunization coverage in young infants. One remaining challenge is the development of a record card that covers one pregnancy to the next, thereby allowing on-going information on the expected immunity of women to tetanus. Tetanus toxoid coverage alone is not the answer to preventing tetanus; programs also need to address intrapartum care and newborn care for high-risk populations. More details on the importance of cord core for the prevention of neonatal tetanus are covered in Table 4E1.5a.

TABLE 4E3.4

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *NEONATAL TETANUS*

Identification

- ✔ Poor feeding (especially after feeding well).
- ✔ Spasms and stiffness, especially stiff jaw.
- ✔ Fever.

Investigations (if available)

- ✔ Blood sugar level.
- ✔ Hemoglobin level.
- ✔ Blood cultures.
- ✔ Lumbar puncture.

Specific treatment

The case fatality rate for neonatal tetanus is around 85 percent, making prevention critical.
The principles are:

- ✔ neutralize tetanus toxoid by giving tetanus antitoxin 5,000 units intramuscularly as a single dose;
- ✔ treat the tetanus infection using penicillin 30 mg/kg per day for 5 days;
- ✔ cover for associated gram-negative sepsis (i.e., gentamicin), depending on local antibiotic policies;
- ✔ control spasms – Treatment is controversial and very difficult because once the baby is sedated to stop spasms, respiratory arrest is a major risk. The goal is to sedate well, and then titrate sedation very carefully against the spasms, tailing off sedation quickly when the spasms stop. Consult your local guidelines for sedation protocols; and
- ✔ avoid hypoglycemia by giving IV fluids or by nasogastric tube feeding when the baby's condition is more stable.

Supportive treatment

The principles are listed under Emergency Newborn Care, Quality Care of the Sick Baby..

Prevention

- ✔ Tetanus toxoid coverage for the mother antenatally (2 shots during pregnancy or 5 shots in a lifetime).
- ✔ Clean delivery, especially a clean surface and a clean implement to cut the cord (consider clean delivery kits, if appropriate).
- ✔ Good cord care and address local cord care practices that are dangerous.
- ✔ Consideration of antiseptics on the cord if the cord is a major source of infection and advise that nothing be put on the cord.

PANEL 4.21
LESSONS LEARNED

CORD CARE, COW DUNG, AND NEONATAL TETANUS

Neonatal tetanus causes an estimated 300,000 deaths each year. Most of these cases occur in ten countries. Within these countries, many of the cases occur in certain subpopulations that have high-risk, traditional practices regarding newborn care and also have low coverage of maternal and newborn health care. Because of clean delivery and newborn care, neonatal tetanus was virtually unheard of in industrialized countries even before tetanus toxoid immunization was developed.

In addition to increasing tetanus toxoid coverage, programs to prevent neonatal tetanus need to address intrapartum care and newborn care with an understanding of the local practices. For example, in rural Northern Pakistan, there is a traditional practice called bundling that involves covering the baby from waist to toes in cow dung and then wrapping the baby tightly in a sheepskin. The practice is usually started at birth and continue until about 3 months of age and is believed to give strength and warmth to the baby.

A case-control study in this area identified 59 cases of neonatal tetanus and 295 matched controls. The fact that only 12 cases were seen by a physician indicates the lack of access to health care. The strongest risk factor for developing neonatal tetanus was delivery on a straw floor. Protective risk factors identified were hand washing by the birth attendant and use of a clean razor to cut the cord. Bundling was common among cases and controls, but for those who were bundled before day 3 of life, the risk of neonatal tetanus was significantly higher. This suggests that the cord is most susceptible to infection during the first 3 days of life. Another study in the same area of Pakistan identified circumcision as an independent risk factor for neonatal tetanus and found that the use of topical antibiotics on the circumcision wound was protective.

Behavioral change programs addressing traditional cord care practices are notoriously difficult. Advising families to put nothing on the cord can be part of this problem. A possible solution may be to substitute a harmful practice, like putting cow dung on the cord, with a beneficial one. A number of topical agents may be beneficial including chlorhexidine, Dettol, and tincture of iodine. These agents have both been shown to reduce bacterial growth on the cord, although no community-based results are available on their effect on cord infection, sepsis, or tetanus outcomes. Iodine may potentially interfere with thyroid metabolism in the neonate. Topical antimicrobial powders on the cord have been shown to reduce tetanus and sepsis, but these carry the risk of increasing resistance and of hypersensitivity reactions. Chlorhexidine wipes could be incorporated into a clean delivery kit or marketed separately for all mothers to use. Use of one of these agents as part of a behavioral change program and evaluation of the impact on morbidity and mortality would be a valuable contribution to our knowledge.

Source: Bennett et al. 1996[130], Bennett et al. 1999[131].

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.5 Sub-Package Component: Neonatal asphyxia

Each year an estimated 1 million babies die of birth asphyxia. As with other emergency conditions newborns face, the key lies in prevention – better intrapartum care and resuscitation at birth, if required. In the absence of intensive care, many babies with severe asphyxia (now often termed hypoxic ischaemic encephalopathy) will die or have a high probability of severe disability. For babies with moderate or milder effects of asphyxia, the probability of long-term survival without disability is reasonably good[132]. Careful supportive management of these babies in the first few days of life is critical.

Babies who are very big at birth or post-term (after 42 weeks of gestation) are at increased risk of obstructed labor and resultant asphyxia. Pregnant women with diabetes or gestational diabetes need to be monitored closely for control of blood sugar during pregnancy, as uncontrolled high blood sugars result in a greater risk of congenital abnormalities and of high birth weight. Maternal high blood sugar levels also increase the probability that the baby will have too much insulin circulating at birth and will have recurrent hypoglycemia for the first few days. Any full-term baby weighing more than 4kg at birth should be considered at risk of being an infant of a diabetic mother, as many cases of gestational diabetes are not detected in low-resource settings. These babies should have blood sugar checked at least once in the first 6 hours of life and should have extra attention to support breastfeeding and correction of hypoglycemia if detected.

Preterm babies are more sensitive to injury from asphyxia and more likely to be severely affected and die or to have a long-term handicap.

The actions required to resuscitate a newborn are outlined in Table 4E3.5.

TABLE 4E3.5

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

PACKAGE COMPONENT – *NEONATAL ASPHYXIA*

Identification

- ✔ Baby did not cry at birth or did not breathe and required resuscitation.
- ✔ History of difficult or prolonged delivery.
- ✔ On the first day of life, baby is very lethargic or twitching.

Specific treatment – Unfortunately, there is no specific treatment. Good supportive care is essential.

Supportive treatment – as listed under Essential Newborn Care

- ✔ Give oxygen, if available, and observe the baby closely for convulsions or ceased breathing.
- ✔ Control seizures with medication as per local protocol (i.e., paraldehyde).
- ✔ Take care to avoid hypoglycemia by feeding the baby regularly by cup or nasogastric tube if the baby is fairly stable, or giving IV dextrose if unstable.
- ✔ Pay close attention to temperature control.
- ✔ Explain carefully to the parents that the next delivery should be in a setting where the baby can be resuscitated well.

Prevention

- ✔ Provide good care during delivery.
- ✔ Identify babies who are more likely to need extra resuscitation (preterm, mothers with complications of pregnancy or delivery) and prepare before delivery, ideally moving the mother to a center where more skilled staff are available.
- ✔ Ensure attendants at delivery are skilled in resuscitation and equipment is available and functional.
- ✔ Have standard resuscitation policies that are understood and used.

Source: WHO/RHR/MSM/98.1[79].

E. NEWBORN CARE INTERVENTION PACKAGE

E3.6 Sub-Package Component: Neonatal jaundice

Jaundice may be an under-reported cause of neonatal mortality and is certainly an important cause of long-term disability in many developing countries[133]. Neonatal jaundice is a special concern in areas such as South Asia and West Africa where the inherited red cell defect of glucose-6-phosphate dehydrogenase deficiency is common and a major cause of neonatal jaundice. Any baby with jaundice noted in the first 48 hours of life should be considered to have serious jaundice. These babies need to be assessed quickly and treated appropriately with phototherapy or exchange transfusion, if indicated (Table 4E3.6).

Quality management of jaundice is difficult in the absence of investigations to detect the level of the bilirubin in the blood, but these investigations are unavailable in many settings. Simple devices have been developed to estimate bilirubin levels including the icterometer, which is a Perspex strip with a series of four colors to compare with the blanched gums of a jaundiced baby. While this improves tracking of jaundice in one baby, it still is not very sensitive for making major decisions, such as whether to undertake an exchange transfusion. The lack of accurate testing may result in undertreatment of jaundice or the overuse of phototherapy and unnecessary separation of mother and baby. The bilirubin level at which to start phototherapy or carry out an exchange transfusion depends on the gestation of the baby, time since birth, whether the baby is ill, and how fast the bilirubin is rising. More details will be available in the WHO manual, "Care of the Sick and Low Birth Weight Newborn," to be released in 2002.

TABLE 4E3.6

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *NEONATAL JAUNDICE*

IDENTIFICATION

- ✔ Yellow skin, especially high levels of bilirubin, starting in the first 2 days of life (assess by looking at the bridge of the nose or at the gums and gently pressing and letting go).
- ✔ Obvious yellow jaundice on the soles of the feet is more likely to be serious jaundice.
- ✔ Convulsions or jitteriness with jaundice may be a sign of the bilirubin crossing into the brain.

INVESTIGATIONS (if available)

- ✔ Blood sugar level.
- ✔ Bilirubin level.
- ✔ Hemoglobin level.
- ✔ Mother's and baby's blood groups; looking for ABO or Rhesus blood group incompatibility.
- ✔ Blood cultures if signs suggest infection (i.e., fever more than 38°C).
- ✔ Screening test for glucose-6-phosphate dehydrogenase (G6PD) deficiency, especially if it is common locally.

SPECIFIC TREATMENT

- ✔ Phototherapy if the bilirubin level is above the threshold for treatment given age and gestation. Technical tip – Phototherapy units can be made with fluorescent light bulbs in a wooden frame above a simple cot. If there is no other option for phototherapy, use direct sunlight on the baby's skin but not in the middle of the day.
- ✔ Exchange transfusion if the bilirubin level is above the threshold for treatment, given age, and gestation.
- ✔ Antibiotic therapy if infection is suspected.

SUPPORTIVE TREATMENT – See Table XXX.

- ✔ Pay careful attention to avoiding hypoglycemia and dehydration, helping the mother to breast-feed the baby or to express and cup feed.
- ✔ If G6PD deficiency or ABO/Rhesus incompatibility is identified, take time to explain to it the parents.

PREVENTION

- ✔ Breastfeed all babies early and support mothers to feed preterm babies who are at higher risk of jaundice and more likely to be damaged by jaundice.
- ✔ Identify before delivery if a woman is at risk of her baby developing serious jaundice and observe the baby in a center where phototherapy and management of jaundice is possible. Major risk factors are:
  - history of a previous baby with severe jaundice; and
  - mother with blood group Rhesus negative.
- ✔ If a baby does develop jaundice in the first 48 hours or high jaundice between day two and day six, identify early and refer quickly.
- ✔ Start phototherapy as soon as it is indicated (also stop as soon as it is not indicated!).

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.7 Sub-Package Component: Birth Defects

Congenital abnormalities are estimated to account for only 11 percent of neonatal deaths globally, but as the incidence of infectious diseases fall, the relative importance of congenital abnormalities will increase. Congenital abnormalities are also a major cause of fetal deaths. In industrialized nations, congenital abnormalities are a leading cause of infant death. It has been estimated that between 50 and 70 percent of congenital abnormalities could be prevented with policy and environmental interventions[134]. There are four major categories of congenital abnormalities that could be addressed at district, national, and international levels at present. These four were selected because they are severe, common in many settings, and intervention is currently feasible:

- neural tube defects, which can be prevented very cheaply through folic acid supplements and account for an estimated 300,000 cases globally[20];
- severe iodine deficiency, which can be prevented by intake of iodized salt;
- down's syndrome (trisomy 18) cases, which can be avoided by meeting unmet need for family planning in older women; and
- congenital rubella syndrome, which causes heart defects, profound deafness, cataracts, severe failure to thrive, and many other abnormalities, can be prevented by rubella immunization. There are an estimated 110,000 to 308,000 infants born with congenital rubella syndrome annually[135,136].

Management of babies born with severe abnormalities in low-resource settings is very difficult. Some defects, such as cleft palates, can undergo surgery in several phases and then do very well. Other conditions will require long-term access to expert neurosurgical or cardiac care that is generally not available. For babies born with abnormalities, one of the main priorities is support for the parents, and particular attention to informing the husband and relatives that the mother is not at fault. Often there is considerable stigma associated with the birth of a baby with abnormalities, and mothers are blamed.

TABLE 4E3.7

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *BIRTH DEFECTS*

Identification

Congenital abnormalities vary from small skin marks to major, obvious defects. Many babies with congenital abnormalities can grow up to live a normal life if treated well. The most common serious abnormalities include:

- ✔ cleft lip and palate;
- ✔ neural tube defects (swelling at the bottom of the baby's back and/or extra fluid on the brain (hydrocephalus)); and
- ✔ congenital heart defects, which may not become obvious for hours or even days.

Specific treatment

Certain abnormalities, such as cleft lip and palate, may do very well with surgery if this procedure is available. Careful help with feeding is also important. Other abnormalities, such as neural tube defects and serious heart defects, are very complex to repair and likely need ongoing expert medical help. With neural tube defects, it is important to remember to advise the mother to take folic acid tablets regularly to avoid recurrence.

Supportive treatment

It is especially important to listen to the parents and support the mother, specifying that she is not to blame for the baby's abnormality.

Prevention

- ✔ Community awareness about the risks of consanguinous marriages, especially first-cousin marriage. Such marriages dramatically increase the risk of having children with autosomal recessive conditions, which are usually rare.
- ✔ Preconceptional folic acid to prevent neural tube defects.
- ✔ Rubella immunization, depending on national policy, to prevent congenital rubella syndrome.
- ✔ Iodine supplementation of salt to prevent cretinism due to serve iodine deficiency during pregnancy.
- ✔ Avoid known toxins, particularly irradiation and heavy metals.
- ✔ Inform women and health care personnel about the risk of taking medications during pregnancy without careful consideration of the consequences.

E3. EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

E3.8 Sub-Package Component: Severe bleeding in the neonate

Although severe bleeding in the neonate is not common, it is life-threatening. The most common causes of severe bleeding are hemorrhagic disease of the newborn (due to Vitamin K deficiency) and sepsis with associated bleeding. Hemorrhagic disease of the newborn usually presents at two to five days of life with bleeding from the gut (vomiting blood or passing stool) or with excessive bleeding from circumcision wounds. The baby is apparently otherwise well, with no fever and no history of feeding poorly. The baby with sepsis has a fever (more than 38°C) and may be bruised and jaundiced.

The management priority is to assess whether the baby requires a blood transfusion, and if so, to organize this intervention and give the transfusion as soon as possible. Hemoglobin levels for transfusion depend on several factors, including the age of the baby, the gestation of the baby, and whether there is active bleeding. Commonly chosen levels for the first week of life are 12 g/dL for term babies and 15 g/dL for preterm babies. Even when the hemoglobin or packed cell volume seems to be well above the transfusion level, if the baby is actively bleeding, blood should be organized for transfusion. If no fresh frozen plasma is available to stop the bleeding in a baby with hemorrhagic disease of the newborn, fresh whole blood can be used instead. However, it should, of course, be screened first for HIV and other transfusion-related infections. All babies with active bleeding should be given Vitamin K intravenously (not intramuscularly as this can cause an intramuscular bleed).

TABLE 4E3.8

EMERGENCY NEWBORN CARE INTERVENTION SUB-PACKAGE

SUB-PACKAGE COMPONENT – *SEVERE BLEEDING*

Identification

- ✔ Baby with obvious blood loss or history of blood loss (usually from cord or circumcision).
- ✔ Very pale baby who is not jaundiced (may have bled into the abdomen or head especially if preterm).

Investigations (if available)

- ✔ Hemoglobin or packed cell volume.
- ✔ Blood group and mother's blood group (always cross-match neonatal transfusions on the mother as well as the baby because maternal antibodies may be circulating in the baby and cause a transfusion reaction).
- ✔ Blood cultures if neonatal sepsis is suspected.

Specific treatment

If a term baby's hemoglobin is less than 12g/dL or above this but the baby is actively bleeding, transfuse the baby with fresh whole blood at 20 mL per kg body weight. For a preterm baby, transfuse if the Hb is less than 15g/dL.

Give IV Vitamin K 2mg daily for 3 days.

Prevention

- ✔ Injection of Vitamin K 0.5 mg intramuscular to all LBW babies (WHO policy).
- ✔ There is current debate as to whether Vitamin K should be given to all newborns. Almost all industrialized countries do so; European countries use oral Vitamin K which has been shown to be effective against early hemorrhagic disease.
- ✔ Early identification and treatment of severe sepsis.

Source: Puckett and Offringa[101].

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LAST WORD

Into Action for Newborn Health

PAGE

I. Into Action Globally: A New Cry for Global Newborn Health LW.1

II. Into Action Locally: Practical Suggestions for Getting Started LW.3

I. INTO ACTION GLOBALLY: A NEW CRY FOR GLOBAL NEWBORN HEALTH

The call to improve newborn health is clearly compelling as it is directly related to saving the lives of four million newborns as well as providing a healthy start in life for all. Key issues must be addressed proactively by the international global health community as well as by local communities. The causes of newborn deaths are strongly related to mothers (their health, status, and access to quality services). Actions to interventions must be grounded in a strong conceptual framework that incorporates both the mother and the newborn and allows interventions to be targeted to evaluate the most critical "Opportunity Gap" despite limited information and resources. Change, even dramatic change, is possible as illustrated in many of the lessons learned in this manual.

For these approaches to work, policy change, political commitment, and resources are required at every level from the grassroots-gatekeepers; community leaders, health care providers, and decision-makers as well as regional and national level.

Improving the quality of perinatal information can result in an apparent rise in infant mortality rates for many countries because improving data quality may mean attaining more realistic figures. This has potential political consequences, and the understandable reluctance to see a rise in national infant mortality statistics should be acknowledged and addressed at an international policy level.

The way forward could be summarized under the following headings:

- decide to act – global and local leadership;
- define priority targets – global and local focus; and
- discuss and disseminate successful models.

Decide to act – global and local leadership

Global leadership and discussion are needed to improve newborn health care and outcomes. Although the international health arena at all levels (unilateral and bilateral agencies, NGOs, and some national governments) is beginning to show interest in newborn health, there is no clear consensus yet on policy content, let alone on implementation. Discussion is slowed by the fact that newborn health issues have been lost between the vertical programs for Safe Motherhood and Child Survival. The best answer seems to be to keep newborn health under the Safe Motherhood umbrella, but to incorporate a new focus and attention and to collaborate with child survival networks.

Specific global goals have been set for the mother in WHO's initiative Making Pregnancy Safer. Goals related to newborn health and the strategies to realize these goals are also required. Stakeholders and partners at all levels, particularly those already in place at the community level, must engage in discussions, especially those already in place at the community level, as this is where most newborn deaths occur. We need to think globally but act locally.

A discussion forum, involving representatives from relevant groups and other key opinion leaders is needed. This would aid partnerships in focusing international attention on newborn health, sharing successful approaches, and gaining consensus on interventions and packages that work. The newly formed interagency group for the newborn (Healthy Newborn Partnership) is aiming to help provide leadership and develop advocacy. The secretariat for this group is with the Saving Newborn Lives Initiative, the Gates Foundation-funded section of the Save the Children Fund.

Local leadership will also be critical and should be developed and encouraged from the beginning of this new focus on newborn health. Community-level discussion and participation will be essential, as the majority of these deaths takes place at home.

Define priority targets – global and local focus

If global strategies can be agreed upon and implemented in partnership, more effective and sustainable progress will be made. Partnerships may be an effective implementation strategy for focus areas, such as neonatal sepsis, tetanus, asphyxia, or LBW, or they may be a strategy to advance the technology, through collaboration on priority research agendas. The implementation of global standards at the local level is a crucial step for improving newborn outcomes and will require major collaborative efforts at all levels.

Discuss and disseminate successful models

Rather than duplicate programs or repeat past failures, we need to assess current and previous practices and collaborate with others already involved or aiming to get involved, in newborn health. Methods should be identified to maximize the success of interventions that can be incorporated within existing programs, such as tetanus toxoid in EPI or training the skilled birth attendant in neonatal resuscitation through the Safe Motherhood programs.

There have been and are a number of successful community-based neonatal programs, but awareness of these programs remains insufficient. A good example is the SEARCH program in rural Maharastra State, India, where illiterate community workers have been trained to recognize and treat neonatal sepsis at home. Neonatal mortality has been reduced by 62 percent at an estimated cost of US $97 per death averted (Panel 4.20)[1]. The Wami project in Bolivia was able to reduce perinatal mortality by about half in two years (Panel 3.60).

The WHO has produced many relevant documents addressing global standards for clinical care in pregnancy, delivery, and newborn care. Debate is needed on the process for implementing guidelines in different settings.

By sharing successes and working with partners, we can turn the vicious cycle of a lack of global newborn health information into a positive cycle to improve maternal and newborn health, thereby reducing this huge burden of death and suffering. If we fail to work together with global newborn health as a priority, millions of "invisible" fetal and neonatal deaths all over the world will continue for a long time to come.

THE RIGHT of the MOTHER and NEWBORN to have...
...the Right Person
...in the Right Place
...at the Right Time
...doing the Right Thing
...in the Right Way



This is the RIGHT of the mother and the newborn.

II. INTO ACTION LOCALLY: PRACTICAL SUGGESTIONS FOR GETTING STARTED

Starting a new program or changing direction in an existing program can be a daunting task. Settings with high levels of newborn mortality are likely to have many other competing health problems and limited resources in finances, health personnel, and program managers. Every setting is different, and this manual has been prepared to be adapted not adopted. However, there are some general principles that may help break the initial inertia of getting started.

Consult stakeholders. Hold a community meeting and discuss newborn health from the community's perspective. Involve other stakeholders, such as local government officials

Find interested colleagues. Call an informal meeting of relevant colleagues (program mangers, district medical officer, midwives, obstetricians, or pediatricians if there are any in your area). Find out what they think the main problems are for newborn health and why. Get together for regular meetings to discuss the issues and what you could do. Work thorough some of the sections in this manual together and discuss them. Get one person to prepare and present a package and what it would take to apply it in your setting.

Look at available data. Involve the community and other stakeholders in this assessment of the data as much as possible. Find local data, such as district health reported perinatal mortality and stillbirth rates. Although the data may not be as complete as we might like, in most settings there are some data that could be used more effectively for programmatic decisions. Both quantitative and qualitative data need to be examined. Quantitative data can assist in defining the broad area of what the problem is while qualitative data help explain the why's. Use available data, such as the district hospital delivery logbook, and plot the deaths into the BABIES assessment tool. Which births and deaths are not being recorded? It may become obvious that more data are required within the subsectors. For example, verbal autopsies and focus groups may be done in the community to assess knowledge, practices and beliefs, barriers to care, and perceptions of the magnitude of the problem.

Use BABIES to identify the "Opportunity Gap." By comparing the local data plotted in BABIES with a standard population, the program manager can identify which area is the most important to start with in the local setting (pre-pregnancy health, care during pregnancy, care during delivery, and newborn care). In many low-resource settings with high infant mortality rates and excessive mortality, an "Opportunity Gap" will be identified in all of the possible focus areas. In this situation, the key area can be selected using the principles discussed in Step 3a of the program management cycle.

Select one intervention strategy that is feasible now. Combining the data and the opinions of the community, your colleagues, and other stakeholders, try to select one intervention that is feasible without major new resources and that will bring obvious results. For example, you might identify birth asphyxia as a problem, related to poor access to emergency obstetric care. You might then add pregnancy planning counseling to existing care during pregnancy, covering recognition of danger signs and plans for emergency access for the mother in order to reduce the delay in access to care. If this is documented to be successful, then the chances of getting attention and funding to improve the quality of emergency obstetric care will be greater.

Document results. Complicated surveillance is not necessary at this stage, but something like the community monitoring board used in Tanzania, would be an efficient way to document outcomes, thereby allowing improvement of the program and also increasing the chances of outside funding.

Be active in looking for more funding. There is growing attention to newborn health, and with this attention will come more opportunities for funding. Some possible sources of information on technical input and funding are available on the CD-ROM.

APPENDIX

PAGE

Glossary A.1

Summary Tables of Interventions by Strategy for each Section A.8
TABLE 1: Basic and Additional Equipment, Supplies and Drugs for Care of the Newborn A.8
TABLE 2: Best Practices for Pre-pregnancy Health by Intervention Strategy A.9
TABLE 3: Best Practices for Care During Pregnancy by Intervention Strategy A.10
TABLE 4: Best Practices for Care During Delivery by Intervention Strategy A.11
TABLE 5: Best Practices for Essential Newborn Care by Intervention Strategy A.12
TABLE 6: Best Practices for Extra Care for LBW Babies by Intervention Strategy A.13
TABLE 7: Best Practices for Emergency Newborn Care by Intervention Strategy A.14

Guide to Using the CD-ROM A.15

Pages for Photocopying A.16

Figure 1.3 Intervention Package for Time Periods of Pregnancy, Neonatal, and Infant Life A.17

Figure 1.8 Conceptual Framework for Causation of Fetal-Neonatal Deaths A.18

Table 2.11 BABIES: An Example Using Raw Numbers A.19

Figure 3.2 The Fishbone Diagram Used to Understand the Root Cause of Neonatal Tetanus . . . A.20

Figure 3.10 Health Countermeasure Matrix A.21

Figure 4.3 Spider Web of Intervention Packages by Time Period (Blank) A.22

Figure 4.3 Spider Web of Intervention Packages by Time Period (Filled-In) A.23

Figure 4.2 Danger Signs for the Mother and the Newborn Throughout Pregnancy, Childbirth, Postpartum, and the Newborn Periods. A.24

Notes A.25

GLOSSARY

Action plan: A plan for the implementation of the countermeasure(s) showing who takes what actions, when they take them, where they take them, and how often they are taken.

Advocacy: Promotion of an issue among policymakers and program planners.

Age at death: Age at time of death of fetus or neonate.

Antenatal care: Health care provided to the pregnant woman, within a clinic or outreach service context.

Assessment of gestational age of baby: The gestational age of a baby can be assessed by use of:

- the last menstrual period, which will be less accurate in societies where prolonged lactational amenorrhea is common or where calendars are not used.
- ultrasound assessment inutero (the gold standard but unavailable in most developing countries).
- clinical assessment of gestation after delivery, using a variety or scores. The well-validated scores are fairly complex and require skill. Simpler scores are available and give moderately accurate assessments.

Assessment of size of baby: The size of a baby can be assessed through foot sole size, tape measurement of chest, head, or arm, spring scales, and balance scales.

Attributable risk: Amount that a risk factor is responsible (attributable) for causing an outcome. The magnitude of the attributable risk percentage of a condition is related to both the severity of the condition and how frequently it occurs.

BABIES (birth weight and age-at-death boxes for an information and evaluation system): An adaptable assessment tool that allows the program manger to collect, organize, analyze, and translate data into information for newborn health interventions. It uses two pieces of date: age-at-death of the fetus/newborn and birth weight group.

Basic Emergency Obstetric care (BEmOC): The ability of a health institution to perform manual removal of retained placental/pieces; assisted vaginal delivery (i.e., vacuum extraction), as well as the ability to administer antibiotics, sedatives (Valium, Magnesium Sulfate) and oxytocics (Ergometrine, Pitocin) IM or IV and IV fluids. It is recommended that there should be four basic EmOC facilities per 500,000 people.

Behavioral change: Characterized as proceeding through four stages – pre-contemplation, contemplation, action, and maintenance of a behavior – usually towards a healthy behavior.

Birth planning: A process that empowers pregnant women, families, and communities to prepare for safe delivery and for motherhood including emergency preparedness.

Birth weight: Weight of baby within 48 hours of birth (ideally taken as soon after birth as possible).

Birth weight group: Category of birth weight; may be divided into categories (i.e., less than 1.499 kg, 1.5 kg to 2.5 kg, greater than or equal to 2.5 kg) or may be assessed in terms of small and normal.

Budget: Planned allocation of funds in a specified period.

Capacity: The ability to fulfill a given role in a given setting; the term may be applied to individuals but is more commonly applied to institutions or organizations. Capacity may apply to a variety of roles (i.e., technical, logistical).

Capacity-building: Increasing the ability of a local institution to provide high-quality services appropriate to the local setting; involves performance assessment and targeted strategies to improve staff competency, supply logistics, and other determinants of quality of care.

Care during delivery: This is the time from the onset of labor until the completion of the third stage of labor. Interventions may include skilled birth attendant, high-quality emergency obstetric care, and basic resuscitation.

Care during pregnancy: Care throughout pregnancy until the onset of labor , including care both at home and in the formal health care system, such as in an antenatal clinic

Count-Divide-Compare: A cycle of activities in applied epidemiology: that 1) counts events; 2) uses division to form ratios, proportions, and rates; and 3) uses ratios, proportions, and rates to compare populations in time, place, and person. The purpose is to promote action to solve a health problem.

Community empowerment: A process whereby communities assume more control for their own well-being, including health practices and services.

Competency-based training: Training of staff to the level at which they are fully skilled in the implementation of a certain practice, such as neonatal resuscitation.

Comprehensive Emergency Obstetric Care (CEmOC): The ability of a health instituion to perform all the Basic EmOCs functions as well as, the ability to perform surgery under general anesthesia, retained placental pieces, and provide blood replacement. It is recommended that there should be one Comprehensive EmOC facilities per 500,000 people.

Consensus: An agreement to support a decision arrived at by the team; it implies a willingness to support the action taken by the team.

Core services: The essential services in any setting for each time period (pre-pregnancy, during pregnancy, during delivery, postpartum/newborn). Shown at the center of the web. (Figure 4.4.)

Countermeasure: A proposed solution to the problem.

Countermeasure matrix: A matrix of factors to help team members show the relationship among the problem statement, root causes, countermeasures, and practical methods to overcome the problem.

Denominator: The population at risk in the calculation of a rate or ratio; the lower portion of a fraction.

Effectiveness: The ability to undertake the "right interventions" to produce a desired result.

Efficiency: The ability to do interventions in the "night way," resulting in high-quality services.

Emergency newborn care: Identification, stabilization, and management of babies with conditions such as neonatal sepsis, asphyxia, and jaundice.

Emergency obstetric care (EmOC): Interventions to appropriately manage obstetrical complications. This includes surgical obstetrics (C-sections, treatment of lacerations, laparotomy), anesthesia, medical treatment of shock, eclampsia and anemia, blood replacement, manual procedures, and assisted delivery.

Emergency preparedness: An approach to promote early recognition of complications for mother and baby at any time during pregnancy, delivery, or after delivery and to maximize the likelihood of timely referral and management. This involves preparedness in the community and in the formal health care system.

Epidemiology: The study of the distribution and determinants of health-related states and events in populations and the application of this study to control health problems.

Essential newborn care: Basic preventive care for all newborns, especially warmth, cleanliness, breastfeeding, cord and eye care, and immunizations.

Evaluation: Comparison of an outcome indicator to a preset objective; measures the result of the interventions on the health of the population (i.e., neonatal mortality rate) according to the objectives set previously.

Extra newborn care: Identification of and additional support for babies who are born weighing less than 2,499 grams. Mortality rates for babies with birth weights between 1,750-2,500 grams can be improved significantly with simple interventions. Babies weighing less than or equal to 1,750 grams at birth are likely to require more specialized care.

Fetal-infant mortality rate =

$$\frac{\text{Late fetal deaths + infant (first year) deaths}}{\text{total births}}$$

Fishbone diagram: A graphic composed of lines and words to represent a meaningful relationship between an effect and its causes; used to identify a cause upon which the team can take action.

Gestational age: Number of completed weeks of pregnancy since the last menstrual period of the mother. Gestational age can also be assessed by examining the physical characteristics of the baby.

Goal: A generally broad statement that guides the overall vision for a program.

Health care delivery system (HCDS): A system that includes all people who provide and receive health care services (i.e., communities, local providers, health institutions, and the intersectoral system).

Health management information system (HMIS): An adaptable system that collects, analyzes, and responds to data about the occurrence and distribution of health outcomes for a population within a given geographical location. It also links these outcomes with other relevant data, which are translated into information to manage the activities that improve health outcomes.

Impact: Effect on population to reduce the undesirable outcome (i.e., death).

Incidence: The number of new cases of an illness or a person being ill in a given time period.

Incidence rate: The rate at which new events occur in the population. The number of new events (i.e., new cases of a specified disease diagnosed or reported during a defined period of time) is the numerator, and the number of persons in the stated population in which the cases occurred is the denominator.

Indicator: A measure that provides information about health outcomes, status, or health service processes.

Infant morality rate (IMR):

$$\frac{\text{Deaths of infants under one year of age}}{\text{1,000 live births}}$$

Infant mortality rate, weight-specific =

$$\frac{\text{Infant deaths in a specific weight group x 1,000}}{\text{live births in the same weight group}}$$

Intermediate LBW: Birth weight of 1,500-2,499 grams.

Intervention Package: A group of evidence-based interventions that are combined to apply to the same time period individually of proven effectiveness in reducing fetal-neonatal mortality and are combines as they apply to the same period (i.e., care during pregnancy) or the same problem (i.e., neonatal tetanus). The Intervention Packages are not just for the formal health sector but for all the sectors of the HCDS.

Intrauterine growth restriction (IUGR): IUGR is restricted growth of the fetus throughout the pregnancy resulting in a baby who weighs less than expected for their gestional age.

Late fetal death: Babies born dead between 28-40 weeks.

Live birth: A baby born with any sign of life regardless of weight or gestation.

Low birth weight (LBW): Birth weight less than 2,500 g.

Management: A process by which one plans, implements, and evaluates an organized response to a health problem.

Maternal mortality rate =

$$\frac{\text{Number of women who die during pregnancy or within 42 days postpartum}}{\text{100,000 women of reproductive age}}$$

Maternal mortality ratio (MMR) =

$$\frac{\text{Number of women who die during pregnancy or within 42 days postpartum}}{\text{100,000 live births}}$$

Monitoring: An ongoing system of data collection and tracking that provides a program manager with information to make management decisions.

Neonatal death: A baby born alive who dies before the 28th day of life.

Neonatal mortality rate (NMR) =

$$\frac{\text{Number of neonatal deaths}}{\text{1,000 live births}}$$

Neonatal period: The first 28 days of life; divided into early neonatal period (first 7 days) and late neonatal period (days 8-28).

Newborn: Baby from birth until 28 completed days of life.

Newborn (neonatal) care: Care from birth until the 28th completed day of life, including care both at home and in the formal health care system. Can be divided into essential, extra and emergency.

Numerator: The absolute number of events; the upper portion of a fraction.

Objectives: Statements about the expected short-term results (3-5 years) of an intervention; objectives should contribute to the overall goal and be specific, measurable, achievable, realistic, and time-bound.

Odds ratio: Ratio of exposure among cases and exposure among controls.

Opportunity Gap: Health indicators in standard population and those in the local population.

Outcome indicator: A measure that provides information about a change in a significant result that reflects health status.

Partograph: A written record charting the progress of labor and delivery and showing the key observations to monitor the women and the fetus, such as pulse, blood pressure, fetal heart rate, etc.

Performance assessment: A process that enables the program manager and stakeholders to assess the effectiveness and quality of interventions.

Perinatal mortality rate (PMR) =

$$\frac{\text{Numbers of fetal deaths after 22 weeks gestation + early neonatal deaths}}{\text{1,000 live births (live births + late fetal deaths)}}$$

Perinatal period: From 22 completed weeks of gestation to 7 completed days after birth.

Personnel plan: A plan that states who is involved in implementing and supporting the interventions.

Policy change: Modification of accepted procedures at any level on which policy is set (i.e., individual, institutional, nation, international).

Population attributable risk: A measure of the amount of disease associated with an exposure within a population.

Postpartum care (PPC): Care from the delivery until the sixth completed week after delivery, including care both at home and in the formal health care system.

Postterm birth: Birth after 42 completed weeks of gestation.

Pre-pregnancy health: The health of the woman before she becomes pregnant.

Premature rupture of membranes: Rupture of membranes before 37 weeks of gestation.

Preterm birth: Live birth before 37 completed weeks of gestation.

Prevalence: The number of instances of a given disease or other condition in a particular population at a specified time.

Prevalence rate (ratio): The total number of individuals who have an attribute or disease at a particular time (or during a particular period) divided by the population at risk of having the attribute or disease at that time or midway through the period.

Prioritization: A process in which potential interventions are reviewed to select those most effective, feasible, and acceptable.

Problem: A gap between the way something is and the way we want it to be. A health problem has to considered from both an epidemiologic and community perspective.

Process: A repetitive and systematic series of actions or operations in which resources are used to develop or deliver products or services.

Process indicator: A measure that provides information about activities that transform inputs into knowledge and training.

Program management cycle: Four-step cycle that assists program managers and key stakeholders to identify the key problems, assess performance of the HCDS, prioritize and implement appropriate interventions, monitor progress, and evaluate outcomes.

Program manager: An individual responsible for program decision-making and implementation.

Prolonged labor: Labor lasting for more than 12 hours.

Prolonged rupture of membranes: Rupture of membranes more than 18 hours before delivery.

Proportion: A type of ratio in which the numerator is included in the denominator. The important difference between a proportion and a ratio is that the numerator of a proportion is included in the population defined by the denominator, whereas this is not necessarily so for a ratio.

Quality management: A process to ensure patient or client satisfaction through involvement of all employees in reliably producing and delivering high-quality products or services.

Quality tools: A method or technique used in the quality management process to assist a team in solving a problem.

Rate: A ratio whose essential characteristics are that time (per minute, per hour, etc.) is an element of the denominator and that there is a distinct relationship between the numerator and denominator. The numerator may be a measured quantity or a counted value.

Ratio: The value obtained by dividing one quantity by another; a general term of which rate, proportion, percentage, prevalence, etc. are subsets.

Relative risk: The ratio of the risk of disease or death among those exposed to the risk compared to the risk among the unexposed; this usage is synonymous with risk ratio.

Right intervention: An intervention that can produce the desired result for a given problem in a given population.

Right way: Implementing an intervention as intended and efficiently, resulting in high-quality services.

Six cleans: 1) clean attendant's hands (washed with soap), 2) clean delivery surface, 3) clean cord-cutting instrument (i.e., razor blade), 4) clean string to tie the cord, 5) clean cloth to wrap the baby, and 6) clean cloth to wrap the mother.

Skilled attendant: Individuals with "midwifery skills (i.e., doctors, midwives, nurses) who have been trained to proficiency in the skills to manage normal deliveries, diagnose, and manage or refer complicated cases." Although trained traditional birth attendants are not included, this does not mean that they cannot play a role in promoting maternal and newborn health.

Small for gestational age: SGA refers to a baby whose weight is less than the 10th percentile for gestation and gender. This term is often used as a proxy for IUGR because of the difficulty determining the "expected weight for gestation and gender." However, some babies who are SGA may not have been growth restricted but are simply inherently small and would normally be under the 10th percentile.

Spider Web Framework: A web diagram showing integrated interventions by time periods (pre-pregnancy, during pregnancy, during delivery, newborn care). Interventions within each package are listed as core (essential for all settings), additional (possible when capacity has been increased), and situational (appropriate if there is a given local problem, such as malaria or HIV). (Figure 4.4.)

Stakeholder: An individual or group that influences decision-making in the community, intersectoral, and formal sectors of the health care delivery system.

Standard population: A reference group used for comparison; appropriate standard populations may be external, national, or internal.

Standards of care: Level of acceptable service that is expected to be delivered to all clients.

Stillbirth/late fetal death: Baby born showing no sign of life who weighs more than 5 grams or is greater than 22 weeks of gestation.

Surveillance: The systematic collection and analysis of data in order to make management decisions.

Team: A high-performance task group whose members are interdependent and share common performance objectives and whose purpose is to improve the quality of products and services.

Term birth: Baby born between 37 and 42 completed weeks of gestation.

Timeline: Schedule of how often a given program will be implemented, monitored, and evaluated.

Total births: All births (live and stillborn).

Total quality management (TQM): A process that ensures patient or client satisfaction through involvement of all employees in reliably producing and delivering quality products or services.

Two-by-two table: A basic analytical structure in epidemiology and the foundation of two-dimensional thinking. It consists of two rows and two columns. Traditionally, the columns are the presence or absence of an outcome. The rows are the presence or absence of a determinant (i.e., risk factor, residence).

Variable: Any quantity that varies. Any attribute, phenomenon, or event that can have different values.

Variable, dependent: A variable whose value depends on the effect of other variables (independent variables) in the relationship under study. A manifestation or outcome whose variation we seek to explain or account for by the influences of independent variables.

Variable, independent: The characteristic being observed or measured that is hypothesized to influence an event or manifestation (the dependent variable) within the defined area of relationships under study; the independent variable is not influenced by the event or manifestation but may cause it to contribute to its variation.

Verbal autopsy: A standardized tool to determine the likely cause of death by discussion with family and community members after the death.

Very low birth weight (VLBW): Birth weight less than 1,500 grams.

APPENDIX – TABLE 1

Summary of Tables of Interventions by Strategy for each Sector

BASIC AND ADDITIONAL EQUIPMENT, SUPPLIES AND DRUGS FOR CARE OF THE NEWBORN

	EQUIPMENT	DRUGS/SUPPLIES
BASIC REQUIREMENTS FOR CORE SERVICES.	• Displayed policies for care of the normal baby, the baby requiring resuscitation and how to stabilize and refer an unwell baby. • Antenatal/delivery records/Newborn record. • Gloves. • Clean instrument to cut the cord with. • Surface available for newborn resuscitation (i.e., angled wooden shelf with overhead lights for heat). • Clock/watch with a second hand. • Suction apparatus (one or more of): – æmucus extractor" – electronic suction – foot-pump operated suction • Self-inflating ventilation bag for resuscitation: – Capacity 250-400 mls. * Pressure valve 45cm of water. * Facemasks for resuscitation: – size 1 for normal babies; – size 0 for LBW babies. • Scales to determine birth weight • Thermometer	• Dry, clean cloths to dry baby. • Baby hat and socks to maintain warmth. • Sterile tie or clamp for cord. • Suction tubes. • Disposable needles and syringes. • Cleaning fluids including bleach and chlorhexidine. • BCG vaccine. • Oral polio vaccine. • Hepatitis B vaccine. • Eye prophylaxis, tetracycline 1% ointment, or whatever is local policy. • Vitamin K injection (intramuscular) 1mg for LBW babies. • Injection Ampicillin, Gentamicin, Penicillin. • Injection Tetanus anti-toxin.
ADDITIONAL AND SITUATIONAL REQUIREMENTS (dependent on local need, capacity, and policy).	• Stethoscope (neonatal). • Low reading thermometer. • Blood sugar sticks for detecting low blood sugar. • Bilirubinometer for "bedside" measurement of bilirubin (jaundice level). • Overhead heater. • Method of avoiding hypthermia in small babies (Kangaroo care, and/or options for warmth for unwell babies requiring observation). * Sterilizer to clean containers for expressed breastmilk.	• Oxygen supply and nasogastric tubes or headbox to delivery the oxygen. • Nasogastric tubes for feeding expressed breastmilk. • 10% dextrose for intravenous use, drip giving sets, and butterflies or other means of intravenous access. • Blood giving sets, ideally with micro-dropper system. • Hypoallergic tape for fixing nasogastric tubes and IV lines. • Injection cephalosporin such as cefotaxime, depending on local policy for treatment of neonatal sepsis. • Vitamin K injection (intramuscular 2 mg for normal babies if this is local policy. • Anti-retroviral treatment for mothers and/or newborns of HIV+ mothers.

Note that this table refers to basic care and stabilization of the newborn, rather than on-going care of the sick newborn.

APPENDIX – TABLE 2

Summary of Tables of Interventions by Strategy for each Sector

BEST PRACTICES FOR PRE-PREGNANCY HEALTH BY INTERVENTION STRATEGY

	INFORMAL HEALTH CARE SYSTEM (community)	FORMAL HEALTH CARE SYSTEM (health system and outreach services)	INTERSECTORAL SYSTEM
COMMUNITY EMPOWERMENT	• Empower community to improve status of women. • Raise female literacy rates. • Establish micro-finance schemes. • Address gender violence and FGM. • Prevent adolescent pregnancy.	• Prevent adolescent pregnancy.	• Raise female literacy rates. • Address violence against women and FGM. • Establish micro-finance schemes.
HEALTHY BEHAVIORS	• Delay age at first pregnancy. • Increase contraceptive prevalence. • Reduce discontinuation of family planning. • Address harmful practices.	• Use social marketing of family planning. • Prevent STIs and HIV, including increased condom use.	• Address smoking among teenage girls if this is a local problem.
OPTIMAL INTERVENTIONS IMPLEMENTED BY CAPABLE INSTITUTIONS	• Increase access to family planning. • Use community-based distribution of family planning.	• Improve quality of family planning services, client-centered, increased method mix, improved logistics. • Identify and treat anemia. • Identify and treat STIs. • Supportive care of HIV. • Provide tetanus toxoid immunization. • Provide rubella immunization, if appropriate.	• Strengthen transport and logistics of family planning supply systems.
SUPPORTIVE PUBLIC POLICY	• Promote good nutrition of the girl child. • Provide policy support for iodination of salt. • Strengthen adolescent pregnancy prevention policies.	• Develop and support immunization policies.	• Develop agricultural projects. • Policy of iodination of salt. • Establish micro-finance schemes. • Strengthen policy deterrents against promotion of adolescent smoking.

APPENDIX – TABLE 3

Summary of Tables of Interventions by Strategy for each Sector

BEST PRACTICES FOR CARE DURING PREGNANCY BY INTERVENTION STRATEGY

	INFORMAL HEALTH CARE SYSTEM (community)	FORMAL HEALTH CARE SYSTEM (health system and outreach services)	INTERSECTORAL SYSTEM
COMMUNITY EMPOWERMENT	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns (i.e., transport, community funds). • Increase status of pregnant women.	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns. • Social marketing of clean delivery kits.	• Establish micro-finance schemes. • Improve transport options for emergency care for mothers and newborns.
HEALTHY BEHAVIORS	• Promote attendance at antenatal clinics. • Increase knowledge of danger signs during pregnancy. • Address harmful practices in pregnancy, i.e., "eating down." • Address violence in pregnancy.	• Provide birth planning services to pregnant women. • Consider targeted nutritional support, i.e., to women weighing <41kg during the "hungry season."	• Promote healthy diet.
OPTIMAL INTERVENTIONS IMPLEMENTED BY CAPABLE INSTITUTIONS	• Increase access to antenatal care services.	• Improve quality of antenatal care services, client-centered. • Provide tetanus toxoid immunization. • Identify and treat anemia. • Identify and treat STIs. • Presumptive treatment of malaria and hookwor. • Voluntary counseling and testing for HIV.	• Strengthen transport and logistics systems for drugs and equipment.
SUPPORTIVE PUBLIC POLICY	• Strengthen public funding and support of antenatal care services.	• Develop and support implementation of evidence-based antenatal care policies. • Implement immunization policies and support.	• Provide policy support for improved transport for emergency health care. • Strengthen systems for recording pregnancy and birth outcomes.

APPENDIX – TABLE 4

Summary of Tables of Interventions by Strategy for each Sector

BEST PRACTICES FOR CARE DURING DELIVERY BY INTERVENTION STRATEGY

	INFORMAL HEALTH CARE SYSTEM (community)	FORMAL HEALTH CARE SYSTEM (health system and outreach services)	INTERSECTORAL SYSTEM
COMMUNITY EMPOWERMENT	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns (i.e., transport, community funds). • Increase male involvemen.t	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns. • Social marketing of clean delivery kits.	• Establish micro-finance schemes. • Improve transport options for emergency care for mothers and newborns.
HEALTHY BEHAVIORS	• Increase knowledge of danger signs during pregnancy and delivery. • Address harmful practices during delivery.	• Increase knowledge of danger signs during pregnancy and labor. • Address harmful practices during delivery.	• Increase knowledge of danger signs during pregnancy and delivery.
OPTIMAL INTERVENTIONS IMPLEMENTED BY CAPABLE INSTITUTIONS	• Increase access to skilled attendant at birth and emergency obstetric care, if required.	• Increase coverage of skilled attendant at delivery, including neonatal resuscitation skills. • Improve quality of emergency obstetric care service, client-centered. • Identify preterm labor and give antibiotics and cortico-steroids, if appropriate. • Implement strategies to reduce MTCT of HIV if appropriate.	–
SUPPORTIVE PUBLIC POLICY	• Strengthen public funding and support of antenatal care services.	• Develop and support implementation of evidence-based intrapartum care policies such as use of partograph.	• Provide policy support for improved transport for emergency health care. • Strengthen systems for recording pregnancy and birth outcomes.

APPENDIX – TABLE 5

Summary of Tables of Interventions by Strategy for each Sector

BEST PRACTICES FOR ESSENTIAL NEWBORN CARE BY INTERVENTION STRATEGY

	INFORMAL HEALTH CARE SYSTEM (community)	FORMAL HEALTH CARE SYSTEM (health system and outreach services)	INTERSECTORAL SYSTEM
COMMUNITY EMPOWERMENT	• Increase the status of the newborn in the community. • Empower the community to carry out essential newborn care for normal babies.	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns. • Social marketing of clean delivery kits.	• Improve transport options for emergency care for mothers and newborns.
HEALTHY BEHAVIORS	• Strengthen behaviors that promote early, exclusive breastfeeding, thermo-protection. • Increase knowledge of danger signs for the newborn. • Address harmful practices that affect the newborn, such as applications to the umbilical cord.	• Strengthen behaviors that promote early, exclusive breastfeeding, thermo-protection. • Increase knowledge of danger signs for the newborn. • Address harmful practices that affect the newborn.	• Increase knowledge of danger signs for the newborn.
OPTIMAL INTERVENTIONS IMPLEMENTED BY CAPABLE INSTITUTIONS	• Increase access to skilled attendant at birth and home care of mother and newborn after delivery, if feasible.	• Increase coverage of skilled attendant at delivery, including neonatal resuscitation skills. • Provide routine immunizations to the baby and vitamin A 200,000 IU to the mother. • Implement strategies to reduce MTCT of HIV if appropriate.	
SUPPORTIVE PUBLIC POLICY	• Strengthen public funding and support of newborn care services. • Strengthen policies that promote immediate, exclusive breastfeeding and feasible alternatives for HIV-positive mothers.	• Develop and support implementation of evidence-based newborn care policies such as prophylactic eye care if high incidence of STIs. • Train and supervise staff in supporting exclusive breastfeeding.	• Provide policy support for improved transport for emergency health care. • Strengthen systems for recording pregnancy and birth outcomes.

APPENDIX – TABLE 6

Summary of Tables of Interventions by Strategy for each Sector

BEST PRACTICES FOR EXTRA CARE FOR LBW BABIES BY INTERVENTION STRATEGY

	INFORMAL HEALTH CARE SYSTEM (community)	FORMAL HEALTH CARE SYSTEM (health system and outreach services)	INTERSECTORAL SYSTEM
COMMUNITY EMPOWERMENT	• Increase the status of the LBW newborn in the community. • Empower the community to carry out extra newborn care for stable LBW babies.	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns. • Social marketing of clean delivery kits.	• Improve transport options for emergency care for mothers and newborns.
HEALTHY BEHAVIORS	• Strengthen behaviors that promote early, exclusive breastfeeding, thermo-protection. • Increase knowledge needed by the community to identify the LBW baby and associated danger signs. • Address harmful practices that affect the LBW baby such as excess bathing resulting in hypothermia[a].	• Strengthen behaviors that promote early, exclusive breastfeeding, thermo-protection. • Increase knowledge of danger signs for the newborn. • Address harmful practices that affect the newborn.	• Increase knowledge of danger signs for the newborn.
OPTIMAL INTERVENTIONS IMPLEMENTED BY CAPABLE INSTITUTIONS	• Increase access to skilled attendant at birth and home care of mother and newborn after delivery, if feasible.	• Increase coverage and quality of skilled attendants at delivery, including neonatal resuscitation skills. • Give injection dexamethasone to women in preterm labor to reduce the risk of respiratory distress. • Train and supervise staff to provide simple extra care of the LBW baby, especially for feeding and identifying danger signs early.	–
SUPPORTIVE PUBLIC POLICY	• Strengthen public policies that promote simple extra care of LBW babies.	• Develop and support implementation of evidence-based newborn care policies such as kangaroo care for stable LBW newborns in institutions, giving vitamin K injections to LBW babies. • Strengthen routine immunization policy for LBW newborns[b].	• Provide policy support for improved transport for emergency health care. • Strengthen systems for recording pregnancy and birth outcomes including birth. weight/size surrogate and gestational age, if feasible.

[a] As noted previously. In areas of high HIV prevalence, it may be policy to wash babies immediately after delivery to reduce MTCT of HIV.
[b] Immunization should be given at the normal age as per national schedule, whatever the baby's size or gestation. Small babies need immunization even more than big babies.

APPENDIX – TABLE 7

Summary of Tables of Interventions by Strategy for each Sector

BEST PRACTICES FOR EMERGENCY NEWBORN CARE BY INTERVENTION STRATEGY

	INFORMAL HEALTH CARE SYSTEM (community)	FORMAL HEALTH CARE SYSTEM (health system and outreach services)	INTERSECTORAL SYSTEM
COMMUNITY EMPOWERMENT	• Increase the status of the ill newborn in the community and expectation for survival.	• Empower community leaders to reduce delays in access to emergency care for mothers and newborns.	• Improve transport options for emergency care for mothers and newborns.
HEALTHY BEHAVIORS	• Increase knowledge needed by the community to identify danger signs for the newborn. • Address harmful practices that cause newborn illness or delay access to care.	• Strengthen behaviors that promote early identification of illness. • Increase knowledge of danger signs for the newborn. • Address harmful practices that affect the newborn.	• Increase knowledge of danger signs for the newborn.
OPTIMAL INTERVENTIONS IMPLEMENTED BY CAPABLE INSTITUTIONS	• Increase access to skilled attendant at birth and home care of mother and newborn after delivery, if feasible. • Increase access to emergency newborn care.	• Increase coverage and quality of emergency newborn care. • Train and supervise staff to identify serious illness, stabilize the baby, and give appropriate treatment for common conditions (serious infections, asphyxia, jaundice, the bleeding baby). • Provide logistical support for supply of drugs and basic equipment.	
SUPPORTIVE PUBLIC POLICY	• Strengthen public policies that promote simple extra care of ill babies.	• Develop and support implementation of evidence-based policies such as kangaroo care for stable LBW newborns in institutions, giving vitamin K injections to LBW babies.	• Provide policy support for improved transport for emergency health care. • Strengthen systems for recording pregnancy and birth outcomes, including cause-specific mortality, if feasible.

GUIDE TO USING THE CD-ROM

HOME PAGE: This self-starting CD-ROM will open at the home page. You can use the CD-ROM in a number of ways:

- to look at the electronic version of the Healthy Newborn Manual and hyperlink to key documents with more detail;
- to read other documents, such as the CARE manual for maternal health programming;
- to use self-training materials, such as BABIES or MAPPS; and
- to print other guides, such as job aids for extra care of LBW babies.

OUTLINE	DESCRIPTION	CONTENTS OVERVIEW PER SECTION
CD-ROM Home Page	The purpose of The Healthy Newborn.	
Contents Index	Overview of contents.	
The Healthy Newborn Manual	The electronic version of this manual with hyperlinks to key references.	
Promoting Quality Maternal and Newborn Care	The electronic version of a CARE manual for maternal health programming prepared by Susan Rae Ross.	
Health Management Information for Newborn Health	Additonal tools and infromation are available in documents listed under the headings of Part II of the manual.	
Step-by-Step Programming for Newborn Health	Additional tools and infromation are available in documents listed under principles and then the four steps of the step-by-step approach to programming.	
Interventions for Newborn Health and Lessons Learned	Relevant documents will be listed under the various packages of interventions.	
Other Weblinks for Newborn Health	Useful websites including more information and details on funding possibilities.	
CCHI, CARE, CDC	Links to the websites of CCHI, CARE, and CDC.	

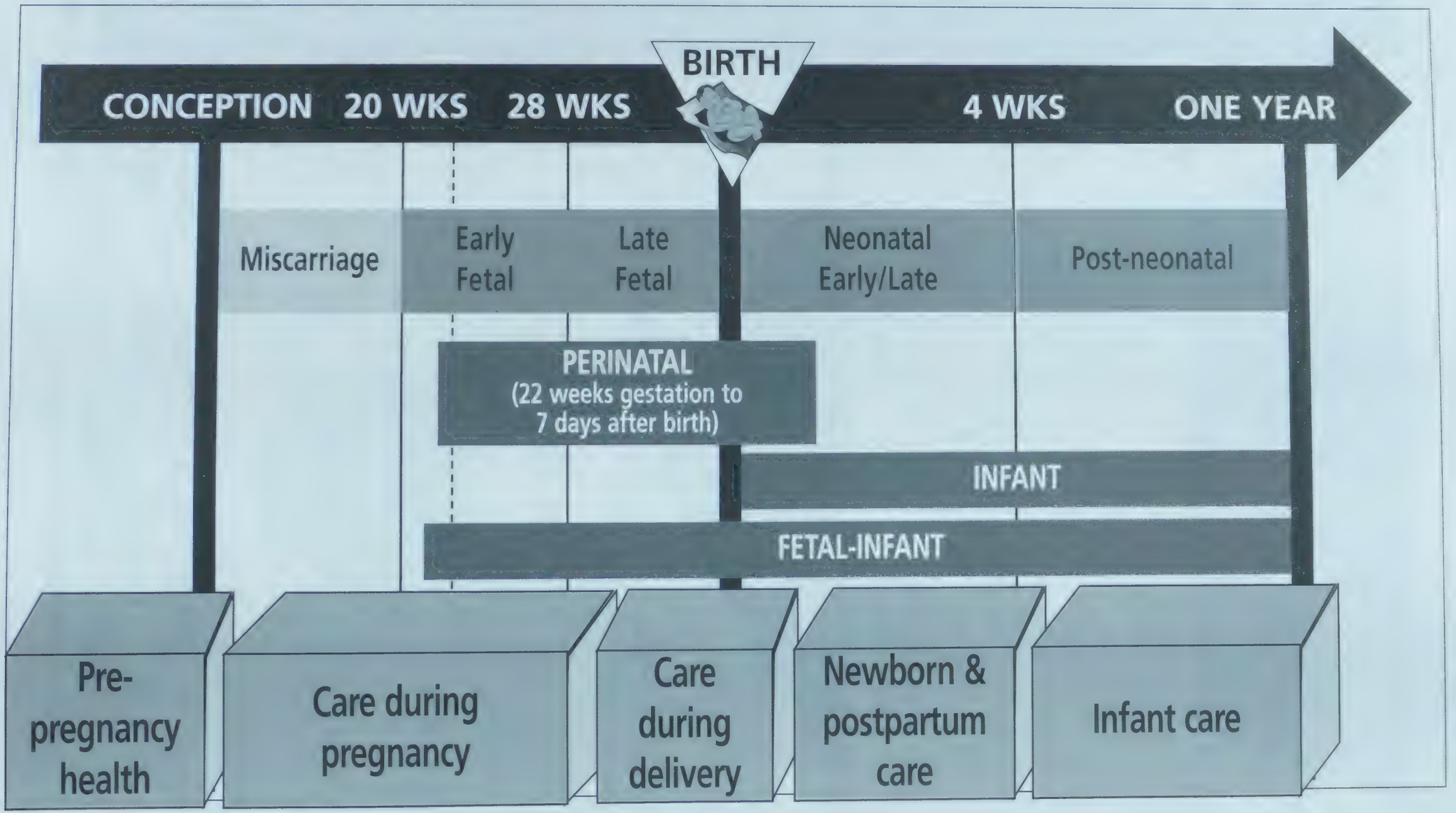
APPENDIX

Pages for Photocopying

The following of the Appendix are inserted for your use to tear-out of the book and photocopy.

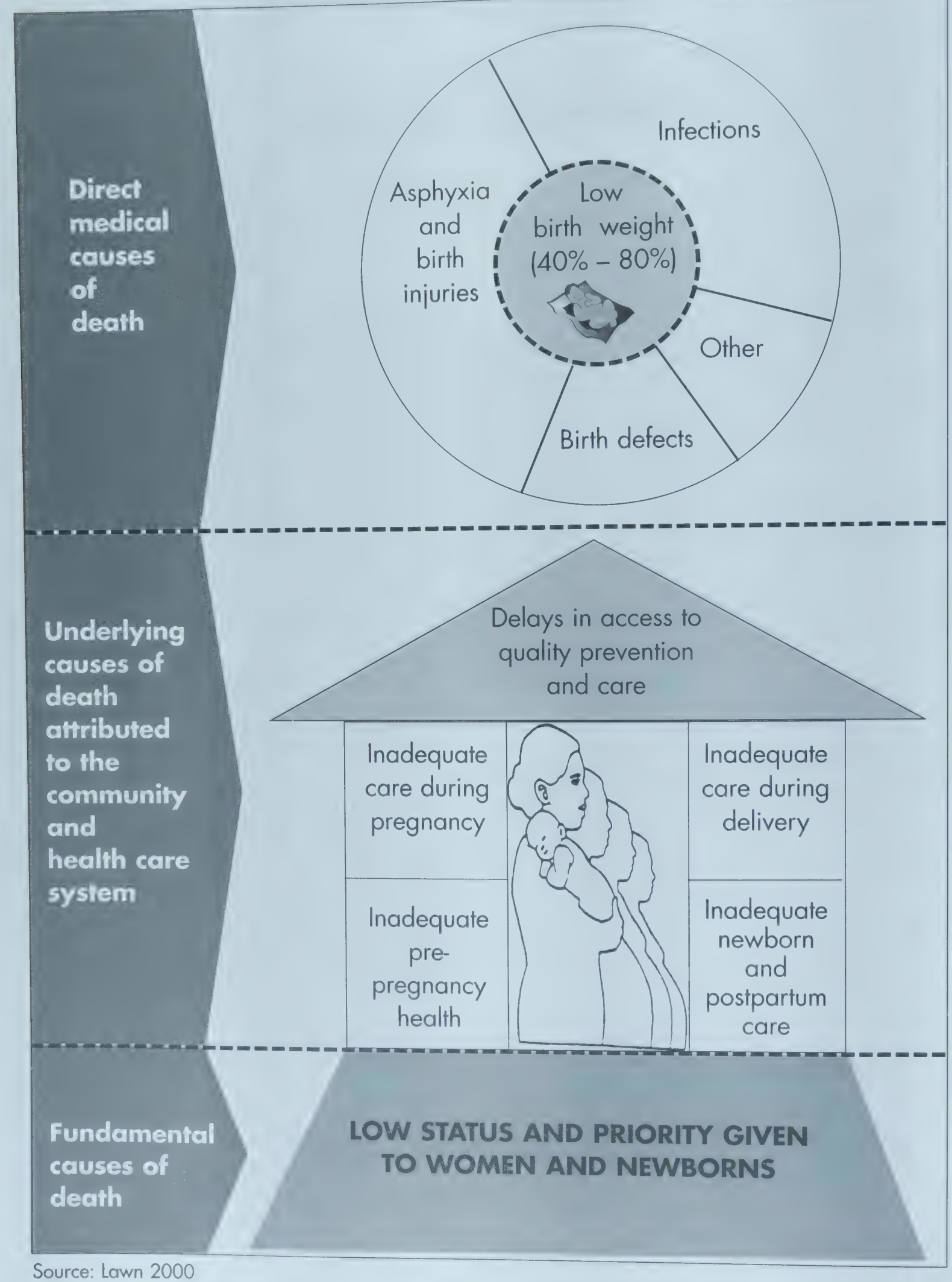
		PAGE
Figure 1.3	Intervention Package for Time Periods of Pregnancy, Neonatal, and Infant Life	A.17
Figure 1.8	Conceptual Framework for Causation of Fetal-Neonatal Deaths	A.18
Table 2.11	BABIES: An Example Using Raw Numbers	A.19
Figure 3.2	The Fishbone Diagram Used to Understand the Root Cause of Neonatal Tetanus	A.20
Figure 3.10	Health Countermeasure Matrix	A.21
Figure 4.3	Spider Web of Intervention Packages by Time Period (Blank)	A.22
Figure 4.3	Spider Web of Intervention Packages by Time Period (Filled-In)	A.23
Figure 4.2	Danger Signs for the Mother and the Newborn Throughout Pregnancy, Childbirth, Postpartum, and the Newborn Periods.	A.24

FIGURE 1.3
INTERVENTION PACKAGE FOR TIME PERIODS OF PREGNANCY, NEONATAL, AND INFANT LIFE



Stillbirths = Babies born dead after 22 weeks of gestation (birth weight more than 500 g)
[Note: WHO recommends international reporting of fetal deaths only for those more than 28 weeks/(1 kg)]

FIGURE 1.8
CONCEPTUAL FRAMEWORK FOR CAUSATION OF FETAL-NEONATAL DEATHS

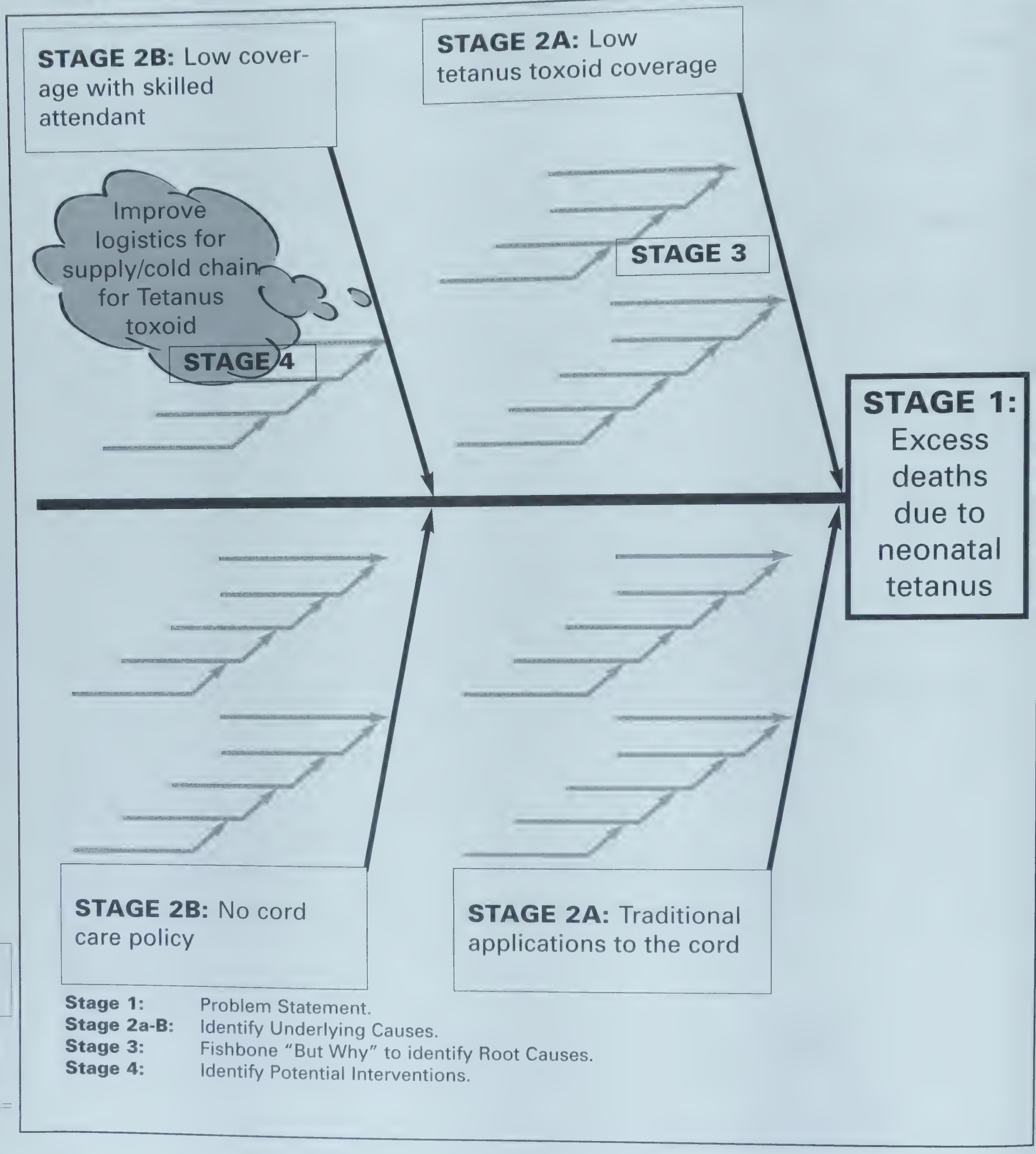


Source: Lawn 2000

TABLE 2.11
BABIES: AN EXAMPLE USING RAW NUMBERS

BIRTH WEIGHT GROUPS	DURING PREGNANCY	DURING DELIVERY	PRE-DISCHARGE	POST - DISCHARGE
<1,500 g	*Cell 1*	*Cell 2*	*Cell 3*	*Cell 4*
1,500-2,499 g	*Cell 5*	*Cell 6*	*Cell 7*	*Cell 8*
>2,500 g	*Cell 9*	*Cell 10*	*Cell 11*	*Cell 12*

FIGURE 3.2
THE FISHBONE DIAGRAM USED TO UNDERSTAND THE ROOT CAUSE OF NEONATAL TETANUS



Stage 1: Problem Statement.
Stage 2a-B: Identify Underlying Causes.
Stage 3: Fishbone "But Why" to identify Root Causes.
Stage 4: Identify Potential Interventions.

FIGURE 3.10
HEALTH COUNTERMEASURE MATRIX

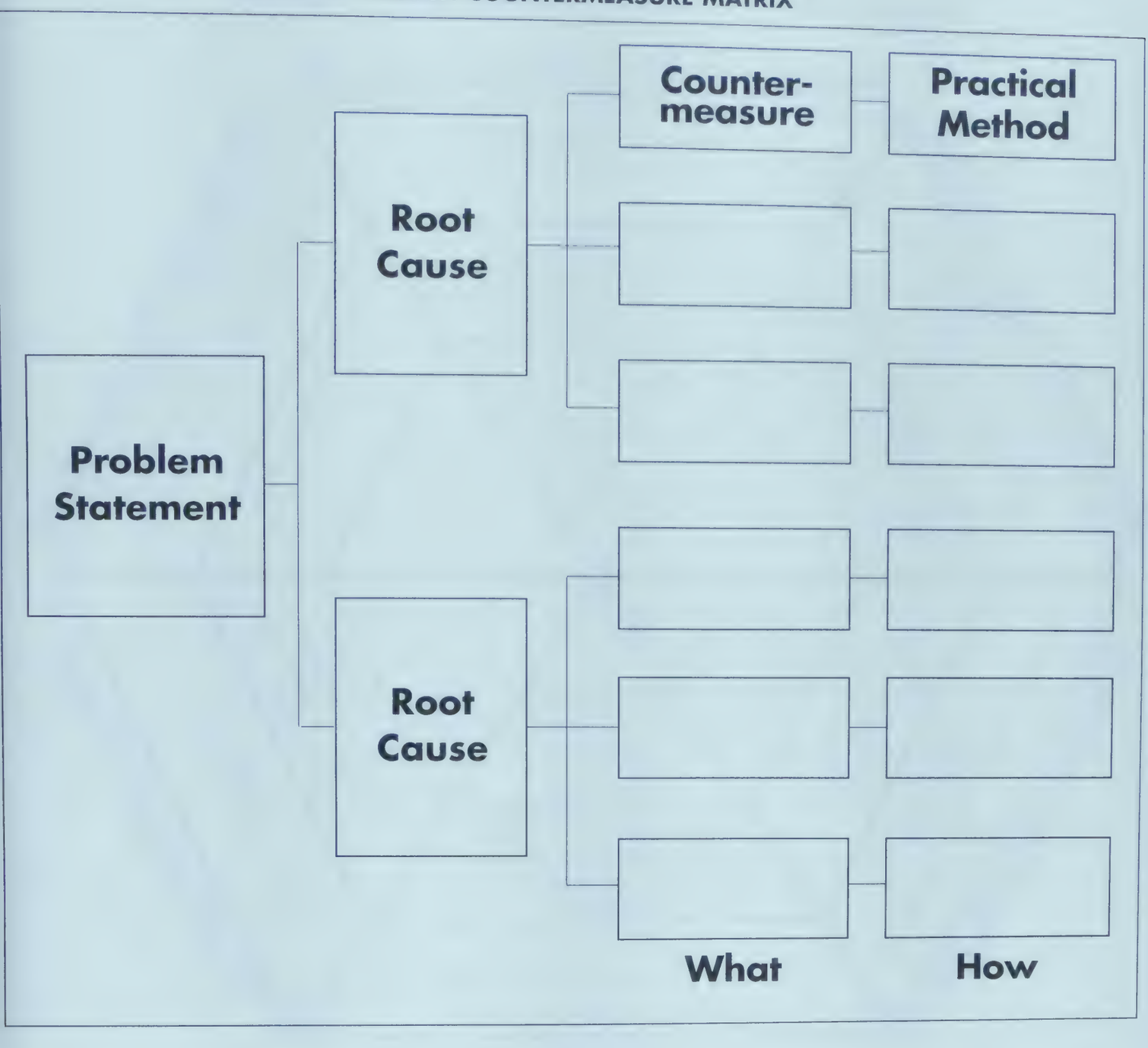
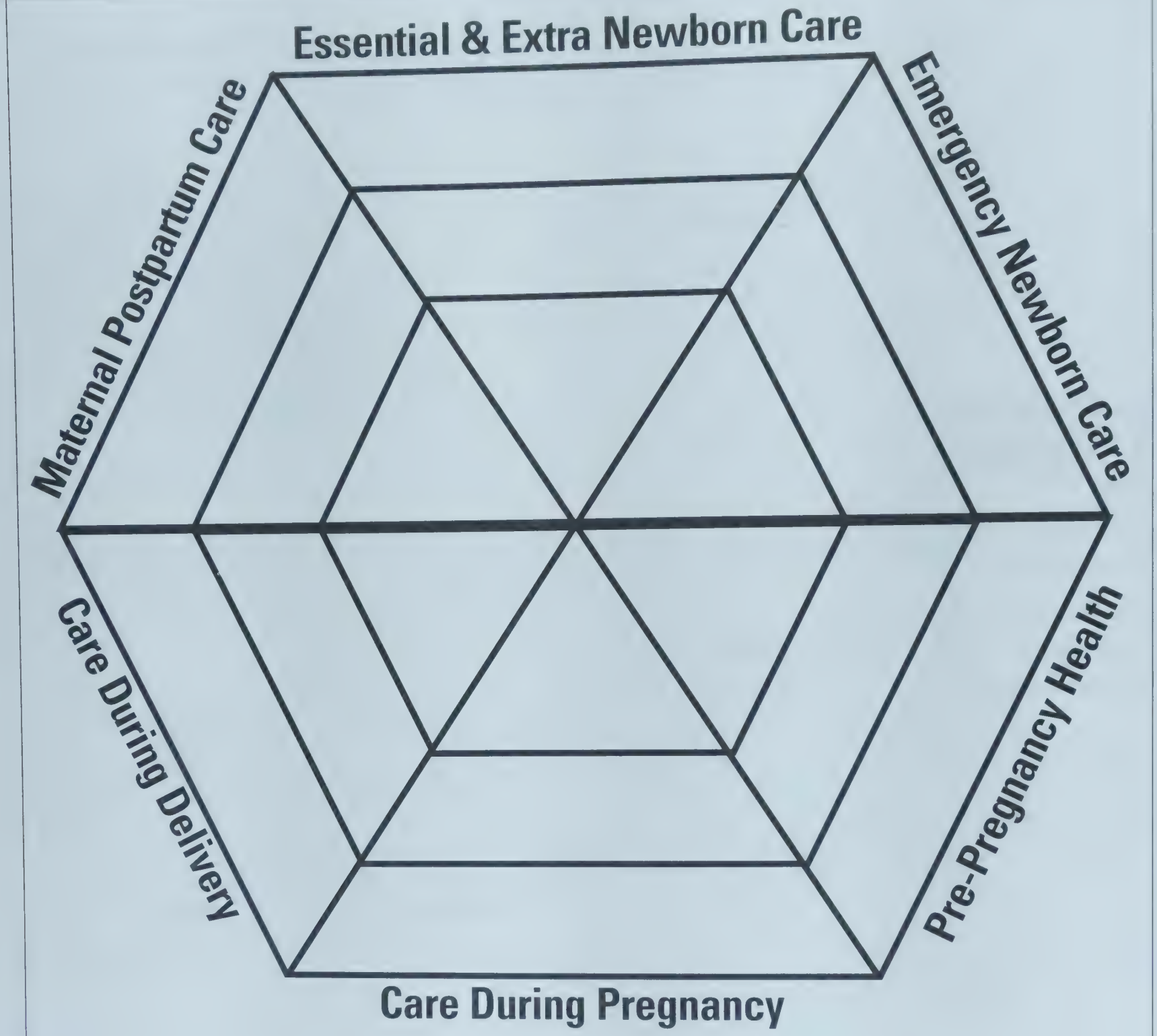


FIGURE 4.3
SPIDER WEB OF INTERVENTION PACKAGES BY TIME PERIOD



KEY

CORE ACTIVITIES/SERVICES (CENTER)

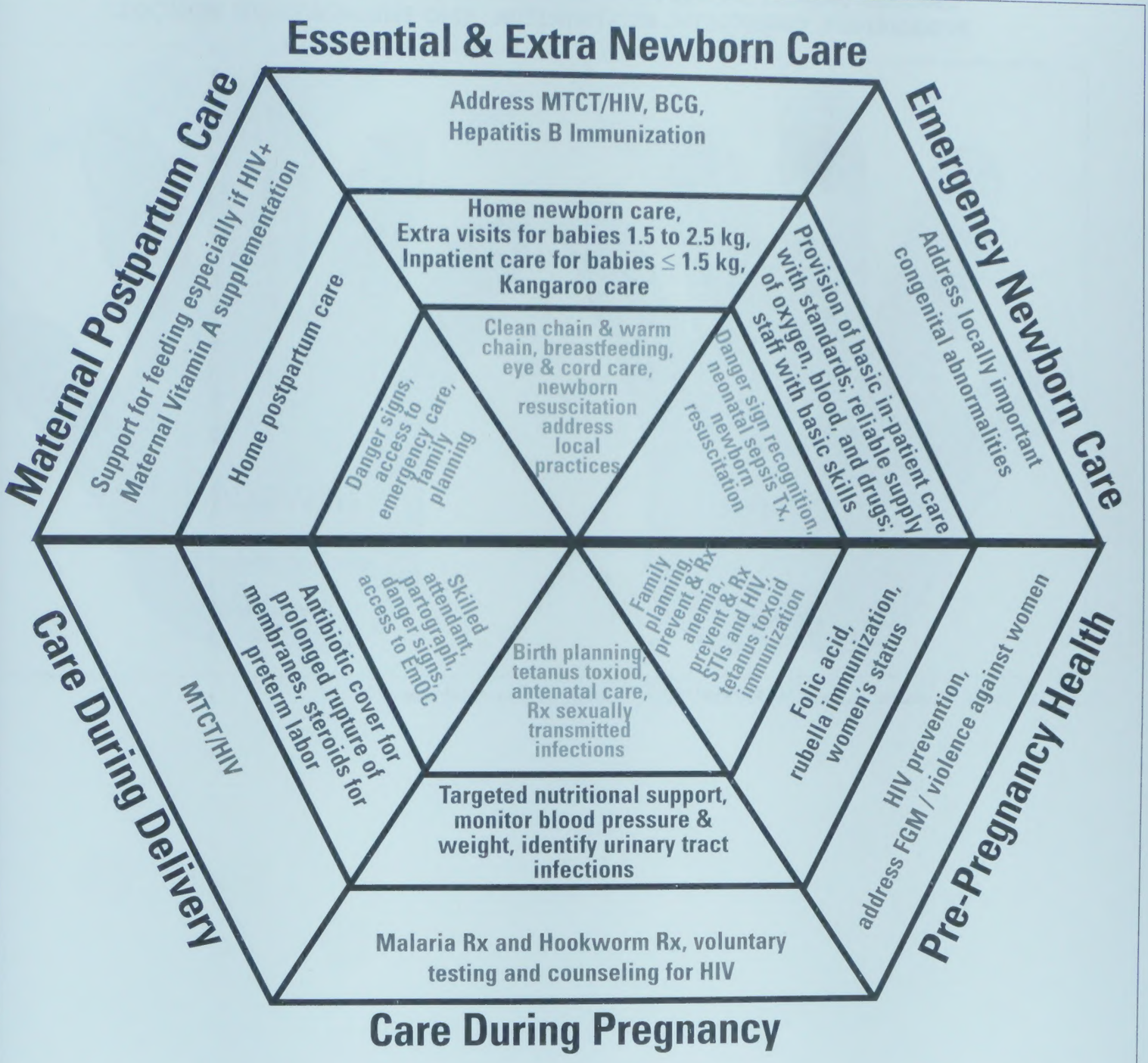
ADDITIONAL ACTIVITIES/SERVICES (MIDDLE)

SITUATIONAL ACTIVITIES/SERVICES (OUTER)

NOTE

These Intervention Packages are suggested only as a guide. What is appropriate in each setting depends on local problems and local capacity.

FIGURE 4.3
SPIDER WEB OF INTERVENTION PACKAGES BY TIME PERIOD



KEY

CORE ACTIVITIES/SERVICES (CENTER)

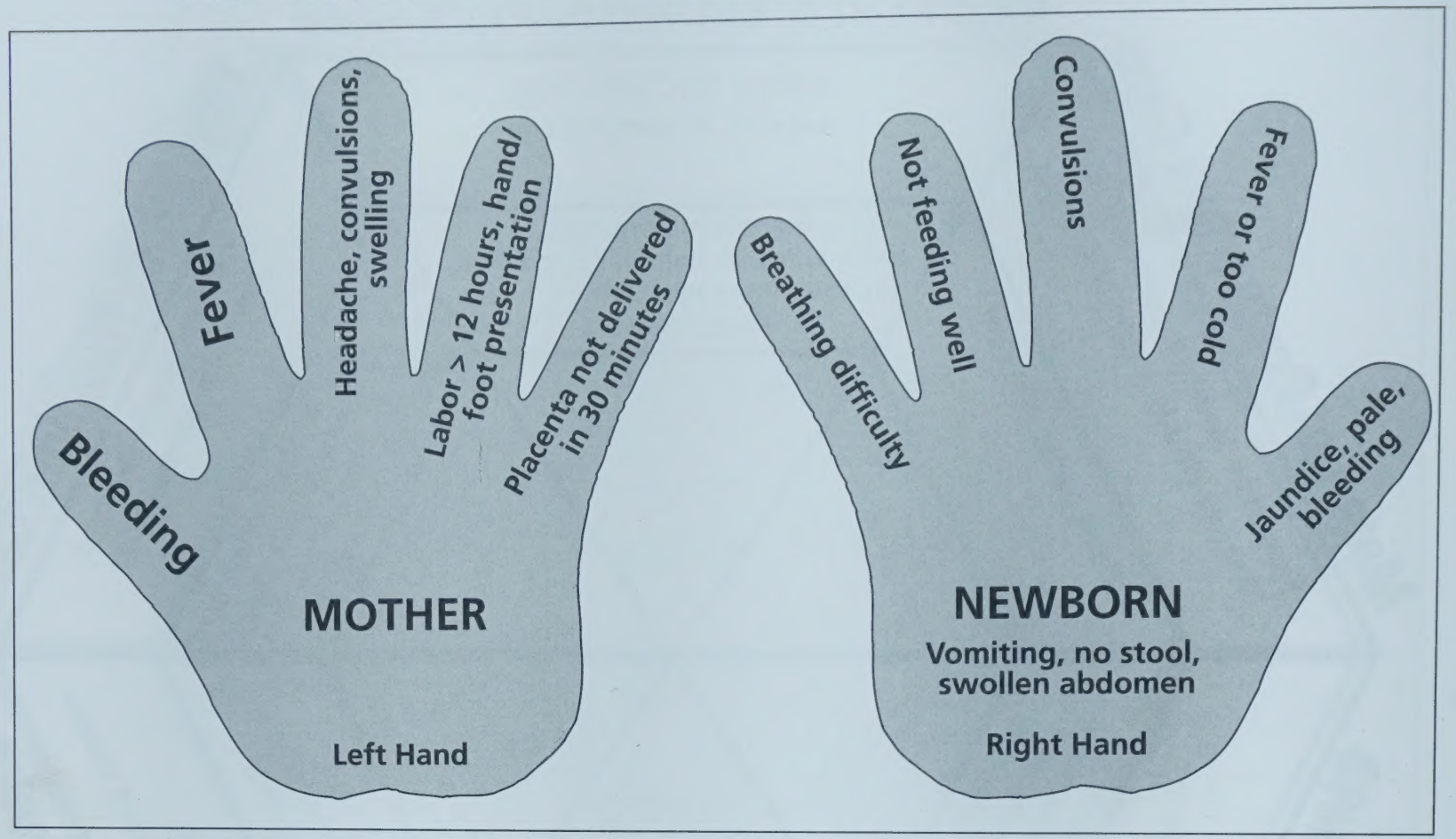
ADDITIONAL ACTIVITIES/SERVICES (MIDDLE)

SITUATIONAL ACTIVITIES/SERVICES (OUTER)

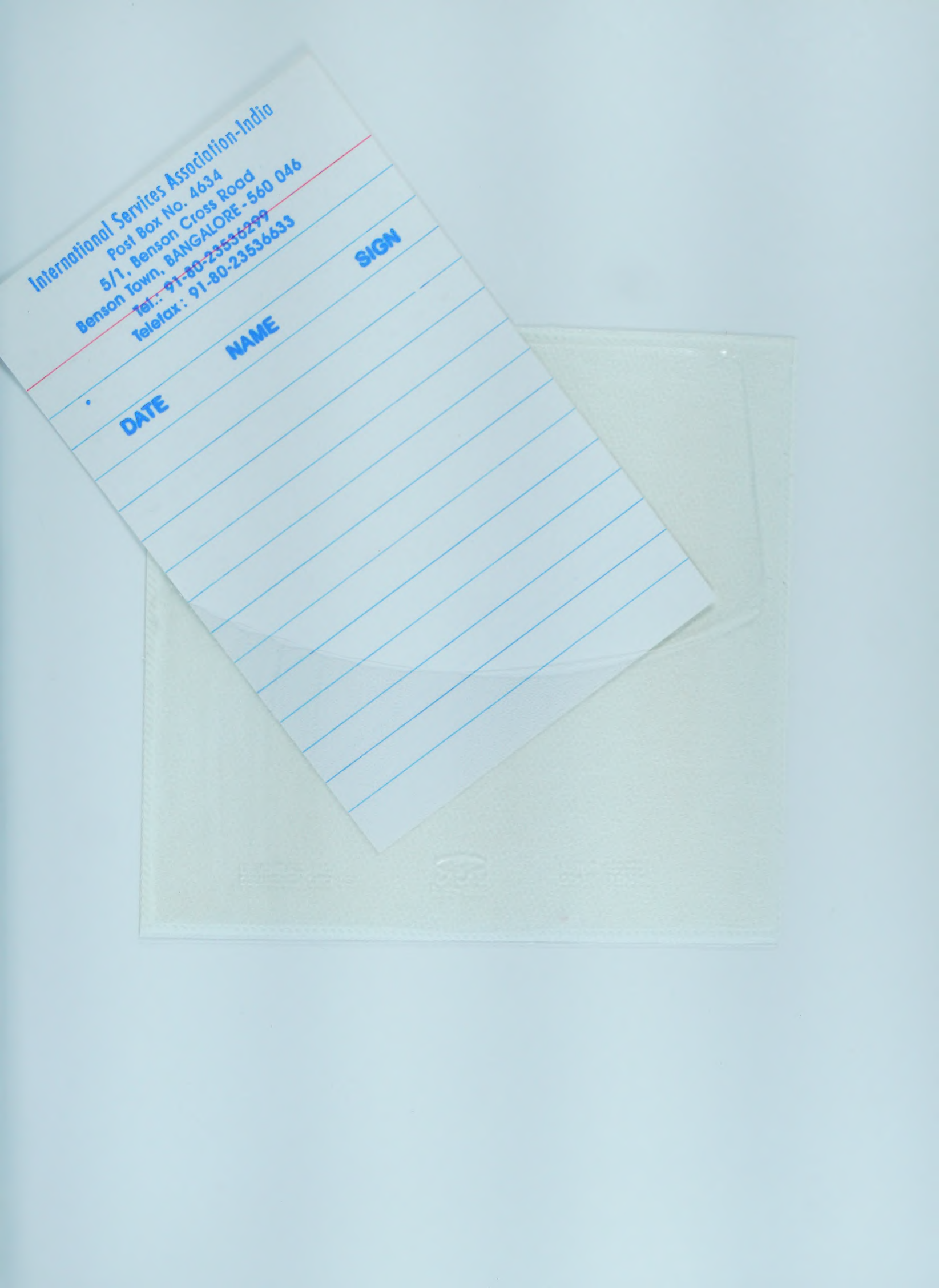
NOTE

These Intervention Packages are suggested only as a guide. What is appropriate in each setting depends on local problems and local capacity.

FIGURE 4.2
DANGER SIGNS FOR THE MOTHER AND THE NEWBORN THROUGHOUT PREGNANCY, CHILDBIRTH, POSTPARTUM, AND THE NEWBORN PERIODS.



Source: Based on danger signs in WHO/RHR/00.7.[7]. Adapted from Bartlett et al[5].

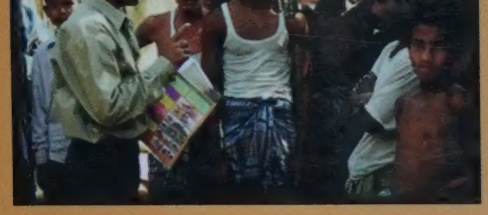

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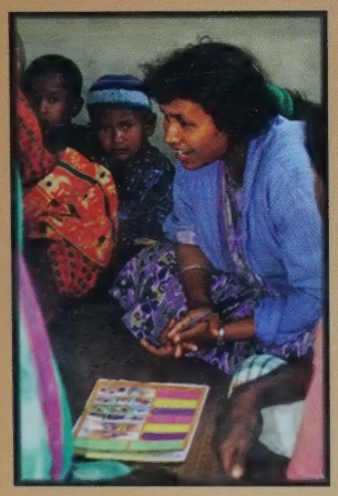














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http://www.cdc.gov/nccdphp/drh/health_newborn.htm

CARE
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